NUCLEAR SCIENCE ABSTRACTS

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AVAILA

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NUCLEAR SCIENCE ABSTRACTS

A Publication of the United States Atomic Energy Commission Technical Information Service.

SCOPE

Nuclear Science Abstracts (NSA) is intended to serve scientists and engineers working in the field of atomic energy by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only unclassified and declassified research reports of the U. S. Atomic Energy Commission and its contractors, but also material that appears in research reports of other U. S. and foreign government agencies, universities, and industrial research organizations and in the technical and scientific journals.

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Other current data on radioactivity, nuclear energy levels, reactions, moments, etc., were also supplied by that group on 3 × 5 inch cards on an annual subscription basis. Beginning in January 1958 the Nuclear Data Group began issuing 8½ × 11 inch Nuclear Data Sheets which replace the cards and also incorporate the table "Radioactivity, Levels, Abundances, Moments," which has comprised the greater portion of the New Nuclear Data issues of *Nuclear Science Abstracts*. For this reason the quarterly issues of New Nuclear Data have been discontinued. The 1958 cumulation of New Nuclear Data consisting of tables previously listed in the quarterly issues, and possibly additional tables, will appear as issue 24B of *Nuclear Science Abstracts* Vol. 12.

The Nuclear Data Sheets are available in a light-weight stock for insertion in binders and a heavy-weight stock for drawer filing. Annual subscription prices are $15 for the light and $18 for the heavy stock. Parcel post will be used in the U.S.A., printed matter mail elsewhere. Order from the Publications Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C.

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The printing of this publication has been approved by the Director of the Bureau of the Budget, July 30, 1957.

CONTENTS

Volume 12, Number 19, October 15, 1958

Category	Abstract	Page
GENERAL	12898	1539
Atomic Power	12898	1539
Research Programs	12908	1540
BIOLOGY AND MEDICINE	12910	1540
Radiation Effects	12913	1540
Radiation Hazards and Protection	12944	1544
Radiography	12958	1546
Radiotherapy	12959	1546
Toxicology Studies	12961	1546
Tracer Applications	12965	1547
CHEMISTRY	12968	1547
Aerosols	12991	1550
Analytical Procedures	12994	1550
Crystallography and Crystal Structure	13002	1551
Deuterium and Deuterium Compounds	13007	1552
Fluorine and Fluorine Compounds	13008	1552
Graphite	13010	1553
Laboratories and Equipment	13017	1554
Radiation Chemistry	13024	1555
Radiation Effects	13031	1556
Rare Earths and Rare-earth Compounds		1556
Separation Procedures	13035	1556
Sorption Phenomena	13060	1560
Syntheses	13062	1560
Transuranic Elements and Compounds	13065	*1560
Uranium and Uranium Compounds	13066	1561
Waste Disposal	13074	1562
ENGINEERING	13078	1562
Heat Transfer and Fluid Flow	13087	1563
Materials Testing	13100	1565
Pumps	13104	1566
Waste Disposal	13105	1566
MINERALOGY, METALLURGY, AND CERAMICS	13106	1566
Ceramics and Refractories	13107	1566
Corrosion	13112	1567

Category	Abstract	Page
MINERALOGY, METALLURGY, AND CERAMICS (cont'd)		
Geology and Mineralogy	13128	1569
Metals and Metallurgy	13131	1570
Tracer Applications	13181	1575
PHYSICS	13184	1576
Astrophysics	13208	1579
Cosmic Radiation	13209	1579
Crystallography and Crystal Structure	13218	1580
Electrical Discharge	13229	1582
Electrons	13289	1590
Gases	13292	1590
Instruments	13297	1591
Isotopes	13305	1592
Isotope Separation	13307	1592
Mass Spectrography	13308	1592
Mathematics	13309	1592
Measuring Instruments and Techniques	13323	1594
Mesons	13344	1597
Meteorology	13368	1599
Molecular Properties	13372	1599
Neutrons	13374	1599
Nuclear Physics	13383	1601
Nuclear Properties	13415	1605
Nuclear Reactors	13443	1608
Nuclear Transformation	13529	1619
Particle Accelerators	13547	1621
Radiation Absorption and Scattering	13558	1622
Radiation Effects	13582	1625
Radioactivity	13584	1625
Rare Earths and Rare-earth Compounds	13596	1626
Shielding	13598	1626
Spectroscopy	13602	1627
Theoretical Physics	13607	1627
Tracer Applications	13631	1630
Uranium and Uranium Compounds	13633	1630
PERSONAL AUTHOR INDEX		INDEX-1
NUMERICAL INDEX OF REPORTS		INDEX-6

ERRATA

NSA Vol. 10, No. 5, p. 395. In abstract 3512, in descriptive cataloging, date July 28, 1953, should be July 28, 1943.

NSA Vol. 12, No. 4, p. 360. In abstract 3200, AERE-RP/P-1810 should be AERE-RP/R-1810.

NSA Vol. 12, No. 6, p. 494. In abstract 4398, UK/O/6/119 should be UK/C/6/119.

NSA Vol. 12, No. 7, p. 538. In abstract 4778, in descriptive cataloging, Decl. with deletions Jan. 11, 1957, should be Decl. Apr. 3, 1957.

NSA Vol. 12, No. 14, p. 1030. In abstract 8934, Am. J. Roentgenol. Radium Therapy Nuclear Med. 79, 101-25(1958) should be Am. J. Roentgenol. Radium Therapy Nuclear Med. 79, 1010-25(1958).

NSA Vol. 12, No. 14, p. 1043. In abstract 9038, add Analyst 83, before 242-4(1958) Apr.

NUCLEAR SCIENCE ABSTRACTS

Volume 12 Number 19 October 15, 1958

GENERAL

Atomic Power

12898 NP-6812

Queensland, Australia. State Electricity Commission. THE ECONOMICS OF ELECTRICITY GENERATION IN QUEENSLAND AND THE POTENTIAL EMPLOYMENT OF NUCLEAR REACTORS. R. D. Waldie. [1957]. 13p.

An endeavor was made to fix a tentative date at which atomic energy is likely to compete with conventional forms of power generation and to indicate the sizes of plant required and cost figures that will be prevailing at that time. (M.H.R.)

12899

THE OUTLOOK FOR ECONOMICAL NUCLEAR POWER. Christopher Hinton (U.K.A.E.A., Industrial Group). Atomics and Nuclear Energy 9, 224-7, 241 (1958) July.

The development of nuclear energy in the U. K. is summarized. The economics of atomic power as affected by the world situation and by improved knowledge of reactor capabilities is discussed. The need for technological development to lower the cost of nuclear power is stressed. (T.R.H.)

12900

NUCLEAR ENERGY, THE POWER OF THE FUTURE. John Cockcroft (United Kingdom Atomic Energy Authority). Beama J. 65, 60-6(1958) May.

The experience obtained by Great Britain in the operation of the Calder Hall nuclear power station is reviewed, and the knowledge gained is applied to possible economic and power improvements in power reactors under construction or planned. The coöperation between industry and the UK Atomic Energy Authority for the development of nuclear power is described, and the benefits accruing to each are discussed. (J.S.R.)

12901

THERMONUCLEAR POWER AND THE PINCH EFFECT. J. E. Allen. Endeavour 17, 117-26(1958) July.

At present power-producing nuclear reactors utilize the fission process. A possible alternative, however, is offered by the fusion of hydrogen isotopes. A discussion is presented of the fusion process and it is shown that fusion power will probably be obtained from a thermonuclear reaction if it can be obtained at all. The extreme physical conditions that must be developed in a power-producing reactor are discussed, and the self-magnetic pinch effect, which offers one of the more promising methods of achieving these conditions, is described in some detail. The instabilities that arise in pinched discharges are described, together with the means used to combat them, and an outline is given of methods that can be used to deliver energy to a pinched discharge, together with possible ways of extracting energy. (auth)

12902

THE GENEVA CONFERENCE SEPTEMBER 1–13. John Cockcroft. New Scientist 4, 407-9(1958) July 17.

The purposes and scope of the Second Geneva Conference are explained. (W.D.M.)

12903

RECENT INDUSTRIAL DEVELOPMENT IN NUCLEAR POWER. Claude Gibb. New Scientist 4, 410-11(1958) July 17.

Advances in industrial development of nuclear power stations in Britain for the past three years are reviewed. (W.D.M.)

12904

GUIDE TO THE NUCLEAR WORLD. New Scientist 4, 419-21(1958) July 17.

Facts about nuclear power development and known fuel sources on a worldwide basis are summarized. (W.D.M.)

12905

THE APPLICATIONS OF THERMONUCLEAR EXPLOSIONS. Camille Rougeron. Paris, Éditions Berger-Levrault, 1956. 306p. (In French)

As an introduction to a discussion of the utilization of thermonuclear explosions, the factors leading to the development of the first H-bomb and the effects of that explosion—the blast, incendiary properties, and the radiation—are described in detail. Next the utilization of thermonuclear explosions in the creation of hydraulic or thermal centers by the blasting of reservoirs and by subterranean explosions is described. It appears possible that thermonuclear explosions can be used to alter the climate of Europe and further the economic conquests of the polar regions. Fertile, but very arid, regions can be irrigated by the release of the water vapor in the air, the transfer of sea water to the deserts, and the channeling of melting snows. Chemical and metallurgical processes requiring high pressures or temperatures can be performed at the thermonuclear subterranean centers. Separate sections are devoted to the effects of thermonuclear explosions on ground, naval, and aerial warfare. In conclusion, the economic impacts of such power are briefly discussed. (J.S.R.)

12906

NUCLEAR ENERGY: BIBLIOGRAPHY, 1946–1958. Nos. 13, 14. Luxemburg, Communaute Européenne du Charbon et de L'Acier, Haute Autorité, 1958. (In English, French, or German)

A bibliography on the problem of nuclear energy covering the years 1947 to March 1958 is presented. After the listing of some publications on some general aspects, the largest part is devoted to articles on the

peaceful applications of nuclear energy in the different countries of the world. Separate sections are also devoted to the social, political, and legal aspects. International agreements and industrial applications both have a section. Articles concerned with the various organizations for the development of nuclear energy such as C.E.R.N. are listed in the last sections. (J.S.R.)

12907

SELECTED READINGS ON ATOMIC ENERGY, UNITED STATES ATOMIC ENERGY COMMISSION. Washington, Atomic Energy Commission, 1958. 77p. Available from U. S. Government Printing Office, Washington for $0.25.

An annotated bibliography on the subject of atomic energy from material published to March 15, 1958, is given. Publications of the AEC and its contractors and other official publications are listed. Books are grouped in the following categories: general, economic, social and political, and scientific and technical. The scientific and technical category is subdivided into physics, chemistry, biology and medicine, and engineering and metallurgy. Other items covered are: periodicals, books for young people, teaching aids, where to obtain research and development reports, official AEC depository libraries, AEC geology–mineralogy depository libraries, and atoms for peace libraries. (M.H.R.)

Research Programs

12908 NP-6839

Denmark. Atomenergikommissionen, Roskilde.

REPORT ON THE ACTIVITIES OF THE DANISH ATOMIC ENERGY COMMISSION UP TO MARCH 31, 1957. Jan. 1958. 43p.

Activities of the Danish Atomic Energy Commission from its establishment in 1955 through March, 1957, are reported. The technical and administrative organization of the Commission are outlined. Contracts were signed for the purchase of two reactors. The site for a reactor research establishment was acquired on the Riso Peninsula near Roskilde. Land for agricultural experiments was acquired nearby. Buildings and facilities were nearing completion by 1957. Training programs for personnel were held. Areas of international cooperation in the peaceful use of atomic energy are outlined. A statement of expenditures is included. (C.H.)

12909 NP-6848

Australia. Commonwealth X-Ray and Radium Lab., Melbourne.

LIST OF PUBLICATIONS ISSUED BY THE LABORATORY, FIRST REVISION. PART I. TECHNICAL COMMUNICATIONS. PART II. MISCELLANEOUS PUBLICATIONS. PART III. SUBJECT INDEX. Library Information Bulletin No. 38. Jan. 1958. 21p.

This Bulletin supersedes Bulletins 29 and 30.

A list is presented of technical and miscellaneous publications issued by the Commonwealth X-Ray and Radium Laboratory of Melbourne, Australia. A subject index is included. (C.H.)

BIOLOGY AND MEDICINE

12910 IGO-AM/W-69

United Kingdom Atomic Energy Authority. Industrial Group. Windscale Works, Sellafield, Cumb., England.

THE DETERMINATION OF THE EXCRETION TIME OF A URINE SAMPLE USING CREATININE CONTENT AS INDEX. O. Folin. Feb. 19, 1957. 4p.

The creatinine is determined spectrophotometrically as the picrate, and excretion time is then derived on the basis of a creatinine excretion rate of 70.5 mg/hr. (auth)

12911 ORNL-2549

Oak Ridge National Lab., Tenn.

THE EFFECT OF THE "TENDENCY TO REPORT INJURIES" ON MINOR ACCIDENT STATISTICS (thesis). J. A. Barker. Aug. 1, 1958. 60p. Contract W-7405-eng-26. $1.75(OTS).

A significant positive relationship was found between injury visits and nonoccupational visits to the dispensary by a group of industrial workers during a two-year period. (C.H.)

12912

RADIATION PRESERVATION OF FOODS: THE PRESENT POSITION. R. S. Hannan. J. Inst. Inter. du Froid 37, (1), 179-209(1957). (In French and English)

Radiation preservation presents a novel approach to the inactivation of food spoilage organisms without heat treatment or addition of chemical preservatives. The processing is readily adaptable to production line working and the radiation can be applied to the outer layers of a food product or uniformly throughout the bulk. Suitable sources of radiation are available now and will become available in increasing quantity. Radiation costs for sterilization are likely to be acceptable for many foods although too high in the first instance for treatment of food of low cost per unit weight. The cost of pasteurization should be acceptable for most products. The main potential application which would concern the refrigeration industry is that the storage life of meats, and possibly fruits and vegetables, under refrigeration might be extended by a factor of two or more. Difficulties with odor and flavour change have still to be surmounted in most cases, however, and this work is therefore still essentially experimental. Sterilization procedures capable of giving a high quality product which could be stored without refrigeration have not yet progressed to the stage where they can be considered as commercially feasible. Cool storage might even be required for such products to control chemical and enzymic change. Sterilization of certain ancillary products such as packaging material are, however, now feasible. Low dosage treatments for disinfestation and prevention of sprouting of potatoes also appear to be effective within limits and might find early application. Various possibilities of combining irradiation with other methods of processing have yet to be fully explored. Extensive and reassuring evidence on the medical acceptability of irradiated food is becoming available, but this aspect of the subject requires much further investigation. (auth)

Radiation Effects

12913 BNL-501

Brookhaven National Lab., Upton, N. Y.

MARCH 1957 MEDICAL SURVEY OF RONGELAP AND UTIRIK PEOPLE THREE YEARS AFTER EXPOSURE TO RADIOACTIVE FALLOUT. Robert A. Conard, Leo M. Meyer, J. Edward Rall, Austin Lowery, Sven A. Bach, Branford Cannon, Edwin L. Carter, Maynard Eicher, and Hyman Hechter. June 1958. 29p. $1.00 (OTS).

Results are reported from a medical survey on the Marshallese people exposed to radioactive fall-out three years previously. Examinations were carried out

on 82 people from Rongelap who had been exposed to the heaviest fall-out, and on a comparison population of unexposed Rongelap people matched for age and sex. The survey showed that all the irradiated Marshallese people were making satisfactory recovery from their radiation exposure. (C.H.)

12914 UCLA-429

California. Univ., Los Angeles. Atomic Energy Project.

SEMI-ANNUAL PROGRESS REPORT FOR THE PERIOD ENDING JUNE 30, 1958. July 10, 1958. 41p. Contract AT(04-1)-GEN-12. $1.25(OTS).

Progress is reported on the following studies: radiation-induced reactions in aqueous solutions of pyridine; the effect of ionizing radiation on the uptake of lipoproteins by ascites tumor cells; the effects of stress on fatty acid metabolism; radiation-induced reactions in aqueous solutions of nitrophenols; the development of tissue culture techniques; the local toxicity of compounds used as organic reactor moderators; the calibration of radiation dosimeters; the development of scintillation detectors; the development of single and double chemical detectors for neutron dosimetry; the pathological effects of chronic β irradiation from Sr^{90} beads implanted within rat femurs; development of a tracer technique for the study of bone metabolism; and the radiobiological-ecological monitoring of selected areas used in the Plumbbob weapons test series. (For preceding period see UCLA-420.) (C.H.)

12915 UR-511

Rochester, N. Y. Univ. Atomic Energy Project.

HORMONE INDUCED LYMPHOCYTE RELEASE FROM THE ISOLATED PERFUSED DOG SPLEEN. Marvin Goldman and L. W. Tuttle. Oct. 1, 1957. 35p. Contract W-7401-eng-49. $4.80(ph OTS); $2.70(mf OTS).

Data are presented on the effects of adrenal cortex extract, hydrocortisone, and cobalt-60 gamma irradiation on the release of splenic lymphocytes into the circulation. (C.H.)

12916 UR-523

Rochester, N. Y. Univ. Atomic Energy Project.

THE RELATIONSHIP BETWEEN THE SURFACE APPEARANCE AND DEPTH OF DAMAGE OF SUBFABRIC AND BARE SKIN BURNS PRODUCED BY RADIANT THERMAL ENERGY. Kelley M. Berkley. Feb. 20, 1958. 24p. Contract W-7401-eng-49. $0.75 (OTS).

In a series of 600 cutaneous burns in swine produced by radiant thermal energy at 0.5 and 5.0 sec exposure time, the relationship of the surface appearance and the depth of damage of bare skin and subfabric burns was investigated. The fabrics used were a black and a gray sateen weighing 8 to 9 oz/yd^2. It was found that there is no significant difference in the 1+ burns whether produced on bare skin or beneath fabric, either at 0.5 or 5.0 sec exposure. However, the 2+ subfabric burns average about 0.1 mm deeper in dermal damage than the same grade burn of bare skin. Nevertheless, the protection afforded by fabric is found to be nearly the same whether the burns were judged by surface appearance or microscopically by depth of damage. (auth)

12917

TUMOR PRODUCTION IN X-RAY- AND CORTISONE-TREATED RATS GIVEN INJECTIONS OF HUMAN CELLS IN CONTINUOUS CULTIVATION. J. Fogh and K. A. Hok (Univ. of California and Cutter Labs., Berkeley, Calif.). Cancer Research 18, 692-7(1958) July.

Data are presented on tumor production in x-ray- and cortisone-treated rats (strain Long-Evans) by seven tissue-cultured strains of human cells in continuous cultivation. The FL strain, derived from a normal human amnion, produced tumors when examined in its 33d transfer. Incidence, tumor size, and appearance are reported and discussed for the seven strains, of which one (HeLa) was of malignant origin, two (FL and Chang's conjunctive) were of normal origin, and four strains (Detroit-6, AH, MF, and 14-87) are characterized as questionable in reference to malignant or normal origin. Regression of tumors has been observed for all the strains. No metastases were seen. Cells derived from tumors could be established in tissue culture and showed characteristics of the original cells. Attempts to establish tumors in nonirradiated rats were negative. Primary cells from the normal human amniotic membrane, whether isolated directly or grown in culture in one passage, failed to support tumor formation. The technic was sensitive but showed a great deal of variation. (auth)

12918

CHANGES IN THE MOUTH REGION UNDER THE INFLUENCE OF IONISING IRRADIATIONS. Ivena Majewska-Nyrkowa. Czasop. stomatol. 9, No. 12, 653-66(1956). (Translated from Referat. Zhur. Biol. No. 16, 1957, Abstract No. 71271)

12919

THE COMBINED EFFECT OF ETHYLENEDIAMINE-TETRAACETIC ACID AND X-RAY RADIATION UPON MICROSPORES OF TRADESCANTIA PALUDOSA AT THE INTERPHASE. N. L. Delone. Doklady Akad. Nauk S.S.S.R. 119, 800-2(1958) Apr. 1. (In Russian)

Experiments revealed that the combined action of ionizing radiation and ethylenediaminetetraacetic acid on chromosomes in addition to quantitative chromosome changes induced qualitative changes of chromatide and semi-chromatide types. (R.V.J.)

12920

ON REFLECTORY CHANGES IN THE MOTOR ACTIVITY OF THE INTESTINE WHOSE MUCOUS IS ACTED UPON WITH CHEMICAL STIMULI AND BETA RAYS. N. A. Rokotova and I. M. Gorbunova (Pavlov Inst. of Physiology, Academy of Sciences, USSR). Doklady Akad. Nauk 119, 1046-9(1958) Apr. 11. (In Russian)

It was found that irradiation of intestinal mucus inhibits the motor activity of the intesting in the same way as chemical stimuli. The reflectory inhibition appears with irradiation doses smaller than 2 r. (R.V.J.)

12921

EFFECT OF FLUOROACETATE AND X RAYS ON THE CITRIC ACID CONTENT IN THE LIVER OF MICE. C. Liébecq and Suzanne Liébecq-Hutter (l'Université de Liège and Laboratoires de Recherches pour la Protection des Populations civiles, Liège). Experientia 14, 216-17(1958). (In French)

In contrast with rats, male mice injected with sodium fluoroacetate accumulate citrate in their livers, whereas females do not. Whole-body irradiation reduces the level of accumulated citrate in the liver as well as in other tissues of the mouse. (auth)

12922

EFFECT OF TOTAL-BODY X RADIATION FROM NEAR-THRESHOLD TO TISSUE-LETHAL DOSES ON SMALL-BOWEL EPITHELIUM OF THE RAT. I. CHANGES IN MORPHOLOGY AND RATE OF CELL DIVISION IN RELATION TO TIME AND DOSE. R. Bland Williams, Jr., Jane Nicolet Toal, Julius White, and Harry M. Carpenter (Naval Medical Research Inst.

and National Cancer Inst., Bethesda, Md.). J. Natl. Cancer Inst. 21, 17-61(1958) July.

A study was made of changes in morphology and mitotic activity associated with changes in nucleic acid metabolism in small-intestinal epithelium of rats following whole-body x irradiation. Data are presented from quantitative measurements of changes in mitotic activity at various intervals after single doses varying from near-threshold to tissue-lethal. Results following local irradiation of an exteriorized loop of small intesting are included. The primary physical and chemical effects of irradiation on cells in interphase at the time of irradiation are discussed. It is concluded that acute cell destruction and prolongation of interphase of stem cells in the crypts of small-bowel epithelium are not mediated through any circulating toxic products or influenced by systemic effects resulting from irradiation. (C.H.)

12923

EFFECT OF TOTAL-BODY X RADIATION FROM NEAR-THRESHOLD TO TISSUE-LETHAL DOSES ON SMALL-BOWEL EPITHELIUM OF THE RAT. II. CHANGES IN NUCLEIC ACID AND PROTEIN SYNTHESIS IN RELATION TO CELL DIVISION. Jane Nicolet Toal, James C. Reid, R. Bland Williams, and Julius White (National Cancer Inst. and Naval Medical Research Inst., Bethesda, Md.). J. Natl. Cancer Inst. 21, 63-76(1958) July.

Changes in nucleic acid and protein synthesis produced in the small intestine of the rat following whole-body x irradiation are described. Glycine-N^{15} was used as a tracer. Quantitative chemical data on radiation-induced changes in the rate of synthesis of protein and nucleic acids are correlated with quantitative biological data obtained under the same experimental conditions. (C.H.)

12924

EFFECTS OF IONIZING RADIATIONS ON THE LIFE CYCLE OF THE GRANULOCYTES AND LYMPHOCYTES OF THE RABBIT STUDIED BY MEANS OF Fe^{59}. L. Resegotti. Minerva Nucleare 2, 169-70 (1958) May-June. (In Italian)

The effect of 200 r of whole-body exposure on the incorporation of plasma labeled with Fe^{59} into the hemins of granulocytes, lymphocytes, and lymph nodes and thymus of rabbits was investigated. The rate of formation of labelled granulocytes decreases under the effects of exposure. The number present in the circulation, however, remains constant due to the release of stored old, non-labelled granulocytes. The number of lymphocytes decreases under the effect of irradiation, but not the specific activity of their hemin iron because the irradiation equally affects the old, non-labelled and young, labelled lymphocytes. The statement of an equality of the specific activity figures of the lymphocyte hemin iron in the control and irradiated animals does not apply to the first hours after labelling the plasma iron. The half life of the iron in the plasma was found to be 134 min in controls, and 194 min in the exposed animals. (auth)

12925

ELECTRON OPTICAL INVESTIGATION ON RADIATION EFFECTS ON THE LIVER, SPLEEN, AND KIDNEY. Eberhard Scherer and Wolrad Vogell (Univ. of Marburg/Lahn). Strahlentherapie 106, 202-11(1958). (In German)

Examinations into the liver, kidney and spleen of mice carried out with the electron microscope in different intervals after a total irradiation of 100 r have proved the absolute usefulness of the method for the exploration of the effect of rays on the cytomorphology. The possibility to represent the subtleties of the cytoplasm and especially of the mitochondria makes the present procedure superior to all other cytological methods. Already one hour after an irradiation of only 100 r, the structure of the mitochondria revealed distinct modifications which may be considered as a sensible indicator of a beginning functional cell damage. According to these examinations liver and kidney must be regarded as radiosensible organs even in view of the administered relatively low doses of rays. (auth)

12926

RADIATION DOSAGE AND LEUCOCYTE DECOMPOSITION. Eberhard Koch and Theophil Hornykiewytsch (Medizinischen Universitätsklinik, Giessen, Germany). Strahlentherapie 106, 223-6(1958). (In German)

Observations on leukocytes from irradiated rats led to the conclusion that exposure to whole-body irradiation induces decomposition of leukocytic blood cells. The intensity and the temporal course of cell reaction depend not only on the dose of radiation, but also on the initial biological condition of the organism. There is probably no immediate action of radiation directed to the leukocytes, but an indirect effect by mediation of humoral factors. The decomposition of the leukocytes does not take place in the streaming blood, but in the tissue. (C.H.)

12927

THE IMPORTANCE OF BIOLOGICAL COMPENSATION PROCESSES FOR THE MEASUREMENT OF RADIATION EFFECTS. Friedrich Gauwerky (Allg. Krankenhauses St. Georg. Hamburg). Strahlentherapie 106, 227-31(1958). (In German)

At the non-irradiated articular extremity of the tibia of young rats roentgen irradiations entail an additional growth, which as an effect of compensation to the radiogenic action depends on dose and fractionation, but which according to its nature can never completely compensate for the disturbance of the bone growth. Extensive investigations on the tibia of the rat allow this general conclusion concerning the laws of compensation. (auth)

12928

THE EFFECT OF ELECTRON RADIATION ON THE REACTION KINETIC BEHAVIOR OF AN ENZYME SYSTEM. Dietrich Harder and Otto Hug (Max-Planck-Institut für Biophysik, Frankfurt am Main). Strahlentherapie 106, 245-52(1958). (In German)

If the reaction velocity of a certain enzymatic system (bacterial luciferase) is registered continuously during and after irradiation with electrons, a distinct recovery of the system is observed. This aptitude can be explained with the biochemical kinetics of the system particularly with the substitution of the inactivated substrat from the precursor. The recovery rate is influenced by the dose dependent inactivation of the enzyme. As recovery processes occur already during the time of irradiation the changes of reaction velocity under irradiation show a dependency from the dose rate. (auth)

12929

THE EFFECT OF CYSTEINE ON THE RADIATION INDUCED INHIBITION OF DNS SYNTHESIS. Heinz Henke, Heinrich Maass, and Gerhard Schubert (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 253-5(1958). (In German)

Twenty-four hours after an irradiation of 800 r, rats were given an intraperitoneal injection of P^{32}. Four hours later the desoxyribonucleic acid (DNA) was isolated from their intestine. The specific activity of the DNA with the irradiated rats had diminished to about

20% of that of the non-irradiated animals. The rats, however, which had previously been treated with cysteine (500 mg cysteine/1 kg body weight) showed a specific activity of about 40%, thus proving a certain protective effect of the administered cysteine. The total quantity of the DNA diminished to the same extent with the animals protected and unprotected. (auth)

12930

THE RADIATION PROTECTIVE EFFECT OF CYSTEIN AND CYSTEAMINE IN REDUCED METABOLISM. Hans-Adam Künkel and Ulrich Heckmann (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 256-9(1958). (In German)

The present experiments show that under certain circumstances, i.e. in case of reduced metabolism, it is possible to intervene in the course of the radiation damage or, in other words, that a biological protection against rays is feasible even after the effect of radiation. At the present date we do not yet know the mechanism which brings about this protective effect, but we hope to approach the solution of this problem by further research, especially by examinations into the bone marrow of the dormouse. (auth)

12931

THE RADIATION SENSITIVITY OF RATS WITH HEIGHTENED BASAL METABOLISM. Matthias Krahe and Hans-Adam Künkel (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 260-2 (1958). (In German)

From the experimental results we may conclude that the height of the basal metabolism during the irradiation decisively influences the effect of radiation. (auth)

12932

THE EFFECT OF X RADIATION ON PROTEIN SYNTHESIS. Gerhard Bettendorf and Heinrich Maass (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 263-5(1958). (In German)

The report deals with investigations into the effect of x rays on the protein metabolism. After an irradiation of 25 kr, the authors could prove a reversible inhibition of the protein synthesis and a general decrease of the amino acid metabolism in tumor cells. Both phenomena have to be considered as a consequence of an inhibition of the glycolysis and of a deficiency of energy-rich phosphate. (auth)

12933

RADIATION EFFECTS ON DPN SYNTHESIS IN TUMOR CELLS. Gunther Heinz Rathgen and Heinrich Maass (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 266-8(1958). (In German)

By means of enzymic analyses of the stationary concentrations of diphosphopyridinnucleotide (DPN) in cells of Yoshida's ascites sarcoma non-irradiated or x irradiated with 25 kr, the authors have proved that the radiogenic inhibition of the glycolysis is due to the intense decrease of the DPN-level in the irradiated tumor cells. (auth)

12934

INDUCTION OF MUTATIONS WITH FAST ELECTRONS. Claus Bertram and Gunter Höhne (Universitäts-Frauenklinik, Hamburg-Eppendorf). Strahlentherapie 106, 269-72(1958).

The authors report about comparative investigations on the induction of mutations in Drosophila by fast electrons of a betatron and by conventional x rays. The rates of ray-induced sex-linked recessive lethal mutations were determined by means of the Muller-5-(Basc) method. Under the described conditions of equivalent doses (4000 and 2000 r resp. rep) 15 Mev electrons and 200 kv x-rays were found to produce the same mutation rates within the range of statistical error. The relative biological effectiveness of the betatron electrons is approximately 1. (auth)

12935

PHOTOMETRIC INVESTIGATIONS ON THE RIBONUCLEOPROTEIN CONTENTS OF WALKER CARCINOMA CELLS AFTER A SINGLE LOCAL X IRRADIATION. Heinz Karl Parchwitz and Elisabeth Wittekindt (Chirurgischen Universitätsklinik und Poliklinik, Bonn). Strahlentherapie 106, 282-8(1958). (In German)

By means of microphotometrical methods the authors have determined the contents of ribonucleoprotein in the nucleole and in the cytoplasm of cells of Walker's carcinoma before and after a single local x ray irradiation of 8000 r. (auth)

12936

THE EFFECT OF VITAMIN B_6 IN RADIATION DAMAGED ORGANISMS. INVESTIGATIONS ON THE TRYPTOPHAN METABOLISM OF X IRRADIATED ANIMALS. Helmut Hartweg and Günther Böwing (Universität Tübingen and Medizinischen Universitätsklinik und -Poliklinik, Tübingen, Germany). Strahlentherapie 106, 289-93(1958). (In German)

A total irradiation of 600 r given to rats entails a latent deficiency of vitamin B_6 which becomes manifest after administration of 100 mg tryptophan. At the same time there can be observed an increased excretion of xanthurene acid in the urine. The supply of 1 mg B_6 maintained for two or three days, prevents these dysregulations of the protein metabolism, but it has no influence on the course of the leukopenia. The latter thus has to be considered as an independent symptom of the radiogenic damage. (auth)

12937

EFFECT OF IONIZING RADIATION ON VITAMINS. 2. NOTE: RIBOFLAVIN. INFLUENCE OF THE DOSAGE (TIME FACTOR) AND RADIATION OF VARIOUS INTENSITY-REACTION MECHANISMS. Hans-Joachim Maurer (Universität und des Inselspitals, Bern). Strahlentherapie 106, 294-9(1958). (In German)

12938

DIRECT AND INDIRECT ACTION OF THE RADIATION EFFECT ON PROTEIN AND AMINO ACIDS. Boris Rajewsky and Klaus Dose (Max Planck-Institut für Biophysik, Frankfurt am Main). Strahlentherapie 106, 300-3(1958). (In German)

The chemical reactions subsequent to the irradiation of chemically uniform solid bodies depends on the condition of these bodies. The reactions to the direct and indirect hits after irradiation of aqueous solutions may be separated from each other because of their different dependence on temperature. The irradiation of simplest molecules mainly entails synthetizing processes. (auth)

12939

THE RELATION BETWEEN METABOLISM AND GENERAL REACTION OF X RADIATION. Giuseppe Matli. Strahlentherapie 106, 304-8(1958). (In German)

The author reports the theoretical bases and the results of experiments carried out with animals in order to examine the possibilities of protection against x rays by artificially provoked hypothermy. (auth)

12940

EFFECT OF X RADIATION ON ISOLATED MUSCLES. Hans-Dietrich Bergeder (Univ. of Bonn). Strahlentherapie 106, 309-12(1958). (In German)

The isolated muscle exposed to a high dose of x rays

reveals functional changes and passes slowly into contracture. These phenomena are developing, while the polarization of the membrane and the intracellular contents of potassium diminish. The author raises the question, to what extent certain reactions of irradiated tissues are due to the loss of potassium. (auth)

12941

THE EFFECT OF RADIATION ON ACETABULARIA. III. THE EFFECT OF X RADIATION AND ULTRAVIOLET RADIATION ON THE NUCLEATED PART OF ACETABULARIA MEDITERRANEA. Erich Six (Max-Planck-Institut fur Meeresbiologie, Wilhelmshaven, Abt. Hämmerling). Z. Naturforsch. 13b, 6-14(1958) Jan. (In German)

A study was made of the effect of x rays and ultraviolet radiation of various wave lengths on the nucleated cell part of Acetabularia mediterranea. The x radiation leads to a reduction of the regenerative capacity, to a decrease of cyst formation of the regenerated cells, and to a lowering of the viability of the cysts. After a dose of 400 hr the regenerative capacity is almost completely destroyed. The capacity for the formation of reproductive gametes is lost after 40 hr. The effect of UV irradiation is, on the other hand, much less. It was concluded that the observed functions of the nucleated cell part are essentially determined by the nucleus, which in rhizoids is extensively shielded against UV radiation. A complete regeneration up to cap formation follows so size and shape of the full-grown regenerated cells do not appear to be influenced essentially by x radiation. (tr-auth)

12942

INSTABLE GENE APPEARANCE FOLLOWING X IRRADIATION OF ARABIDOPSIS THALIANA (L) HEYNH. Gerhard Robbelen (Univ. Freiburg i. Br.) Z. Naturforsch. 13b, 14-16(1958) Jan. (In German)

An instable recessive chlorophyll gene was observed following the x irradiation of Arabidopsis thaliana. The appearance of this gene falls in successive generations from a high in F_2 to a constant final state in F_7. Instead of using the variation of the heredity-bearing structure as a working hypothesis, a radiation-induced effect on the gene-dependent physiologic processes was assumed. (J.S.R.)

12943

INVESTIGATION OF THE RADIOSENSITIVE PHASE IN ANTIBODY FORMATION. H. St. Stender, D. Strauch, and H. Winter (Justus Liebig-Universität Giessen). Z. Naturforsch. 13b, 17-19(1958) Jan. (In German)

In the process of antibody formation a radiosensitive initial phase lasting for a few hours and a successive radioresistant phase were noticed by various authors. The reason for the variation in radiosensitivity could be the interval between the irradiation and the injection of antigens and the processes initiated by this injection. In order to investigate the significance of antigens to radiosensitivity, rats, a short time after whole-body irradiation with 200 r, were injected subcutaneously with a carbon suspension to stimulate the lympho-reticular tissues, and antigens were not administered until 48 hours after the irradiation. Under these conditions a time-dependent antibody formation occurs. In the few hours before the radiation damage was completely developed, an accelerated regeneration of the lympho-reticular tissue and of its functions with respect to antibody formation was introduced by the carbon stimulation. A radiosensitive phase dependent on the presence of antigens was not demonstrated. (tr-auth)

Radiation Hazards and Protection

12944 AECU-3666

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

EFFICIENCY OF SCAVENGING DEVICES USED IN DETERMINING FALLOUT. Report No. 7 (Final). Jan Rosinski. Feb. 24, 1958. 29p. ARF Project C 082. Contract AT(11-1)-275. $1.00(OTS).

Preliminary evaluation of the proposed artificial grass sampler under field conditions was made by comparison of sampling with gummed film and a stainless steel high-walled pot. The total collection of radioactive fall-out on the grass sampler was approximately 1.5 and 7 times larger than that of the high-walled pot and the gummed film, respectively. A general discussion of calculations performed in connection with the correction factors for sampling with gummed film is given. Preliminary evaluation of high-walled pots is discussed and recommendations are given. (For previous report see AECU-3547.) (auth)

12945 ANU/P-189

Australia. Commonwealth X-Ray and Radium Lab., Melbourne; Australia. Commonwealth Bureau of Meteorology, Melbourne; Australia. Cancer Inst. Board of Victoria; Australian National Univ., Canberra; and Australia. Atomic Weapons Test Safety Committee.

GLOBAL FALL OUT IN AUSTRALIA DURING THE PERIOD NOVEMBER 26, 1956 TO DECEMBER 31, 1957. D. W. Keam, L. J. Dwyer, J. H. Martin, D. J. Stevens, and E. W. Titterton. Apr. 22, 1958. 5p.

Seventeen stations for the collection of fall-out were operated over the period November 26, 1956 to December 31, 1957. Data are reported, with the emission of the period of the Antler series weapons trials from September 13 to November 9, 1957. The only significant activity collected during the period occurred in Brisbane on November 23, 1957. The origin of the activity is unknown. (C.H.)

12946 BNL-497

Brookhaven National Lab., Upton, N. Y.

THE ACCUMULATION OF RADIOACTIVE FALLOUT ON TYPICAL MATERIALS OF CONSTRUCTION. F. P. Cowan. Mar. 1958. 10p. $0.50(OTS).

Test panels of six materials commonly used in building construction were exposed to the weather continuously and were counted at intervals before and after attempts at decontamination with water or household detergents. The exposures were made at Upton, New York, during the 1957 Nevada test series. Data are tabulated and presented graphically. (C.H.)

12947 RM-1956(RAND)

RAND Corp., Santa Monica, Calif.

NOTE ON THE Sr^{90} HAZARD. Albert L. Latter and Milton S. Plesset. Jan. 31, 1958. 14p. (AD-150658).

From measurements on the worldwide fallout, the amount of available natural strontium in the soil is calculated to be about 66 pounds per acre. This result, in conjunction with recently measured values for the discrimination factor of strontium relative to calcium in the ecological chains from the soil to man, implies an amount of available calcium in the soil between 3700 and 15,000 pounds per acre. These ideas have been combined with a result due to E. B. Lewis relating leukemia incidence to radiation doses, to determine the number of deaths from bone cancer and leukemia expected per megaton of fission energy exploded. This quantity has

also been estimated by the Federation of American Scientists and presented in their testimony before the Holifield Committee. They give a range of 500 to 2000 expected deaths per megaton. The number obtained in this report is about 200. (auth)

12948

ACTIVATION OF AIR BY RADIATION FROM A SYNCHROCYCLOTRON. M. M. Komochkov and V. N. Mekhedov. Atomnaya Energ. 4, 471-4(1958) May. (In Russian)

The air contamination level, the basic components of isotopic composition, the safety condition for the working personnel, and the safety area around the building were evaluated. (R.V.J.)

12949

EFFECT OF CHEMICAL PROTECTION AND BONE MARROW TREATMENT ON RADIATION INJURY IN MICE. Paul Urso, C. C. Congdon, D. G. Doherty, and Raymond Shapira (Oak Ridge National Lab., Tenn.). Blood 13, 665-76(1958) July.

2-mercaptoethylguanine·HBr (MEG), prepared from 9.0 mg of S,2-aminoethylisothiuronium·Br·HBr (AET) significantly modified the response of the bone marrow, peripheral blood leukocytes, spleen, thymus, body weight, hematocrit, and histology of the hematopoietic organs to lethal (900 r) and sublethal (450 r) x-irradiation in CAF_1 mice. MEG reduced the effect of 900 r on the bone marrow, granulocytes of the blood, hematocrit, spleen, thymus, and body weight by a factor of approximately two. Combined treatment (MEG and isologous bone marrow) of mice exposed to 900 r of x rays demonstrated that MEG is primarily responsible for preventing the early destruction of the bone marrow, but bone marrow injection was primarily responsible for causing a more rapid recovery of the bone marrow. In mice receiving combined treatment, recovery of the leukocytes and spleen was primarily influenced by the bone marrow injection; whereas recovery of the thymus and body weight was primarily influenced by MEG. The hematocrit values were normal after combined treatment. (auth)

12950

CONSIDERATIONS ON THE METHODS OF CONTROL OF RADIOACTIVITY IN THE VICINITY OF A REACTOR. A. Malvicini (C. N. R. N., Milan). Minerva Nucleare 2, 180-2(1958) May-June. (In Italian)

The methods for the control of the various contaminable media (air, water, soil, etc.) are discussed, and the design of a typical station for the examination of samples of dust is described. The most suitable instruments for these controls are described, and the data obtained are reported. (auth)

12951

AN INTERNATIONAL MILK TEETH RADIATION CENSUS. Herman M. Kalckar (U. S. Dept. of Health, Education, and Welfare, Bethesda, Md.). Nature 182, 283-4(1958) Aug. 2.

It is proposed that the official public health agencies of every nation organize a large-scale collection of milk teeth from children and conduct measurements of radioactivity of the material. Data on dates of appearance and shedding and the child's age in each instance should also be collected. Such a census would contribute important information concerning the amount and kind of radiation received by the most sensitive section of any population, namely, the children. (C.H.)

12952

RADIATION PROTECTION. E. E. Smith. New Scientist 4, 217-18(1958) June 19.

The basis of radiation protection is the limitation of the dose received. In specifying permissible levels of irradiation the factors to be considered are (1) the source of the radiation, external or internal, (2) exposure to total or partial irradiation, and (3) the biological effects involved, somatic or genetic. The basic principles of radiation protection based on these considerations are discussed, and the more important permissible doses that have been recommended are indicated. (J.S.R.)

12953

LYMPHATIC TISSUE CHANGES IN LETHALLY IRRADIATED MICE GIVEN SPLEEN CELLS INTRAVENOUSLY. C. C. Congdon, T. Makinodan, N. Gengozian, I. C. Shekarchi, and I. S. Urso (Oak Ridge National Lab., Tenn.). J. Natl. Cancer Inst. 21, 193-211(1958) July.

Changes in lymphatic tissue are described which were observed in lethally irradiated mice following the injection of isologous and homologous spleen homogenates. The tissue changes described indicate the transplantation of the immune mechanism. (C.H.)

12954

MEDULLARY CELL SUSPENSION FOR RADIATION INDUCED BONE MARROW DAMAGE. Theodor M. Fliedner (Univ. of Heidelberg). Strahlentherapie 106, 212-22(1958). (In German)

Inbred rats maintained at this institute were given 800 rep of radiation with 15 Mev electrons to the whole body. Immediately after irradiation the animals were injected intravenously with a suspension of bone marrow cells from unirradiated animals of the same strain. Compared to untreated control animals, there was a more rapid regeneration of the bone marrow beginning the third day after irradiation. Regeneration was more pronounced in the erythropoietic series; no significant acceleration of myelopoiesis resulted. The degree of hemorrhage noted on the third day after irradiation was less in the treated animals. The injected marrow did not affect the onset of marrow aplasia nor the circulatory changes seen within 24 hours of exposure.

12955

THE EFFECT OF INDICATORS (DETECTORS) IN RADIATION BIOLOGY AND THERAPY. Gian Giuseppe Palmieri (Instituto del Radio Polichlinico S. Orsola, Bologna). Strahlentherapie 106, 232-44(1958). (In German)

After in-vitro-examinations into the effect of isotonic salt solutions on previously irradiated tissue of chick embryos, the same solutions were tested in vivo as to their effect on spontaneous tumors of the mouse and of man. By injection of different quantities of Ringer's solution into previously irradiated tumors, the author could prove an elective diminution of the neoplastic elements nearly without exception even in radioresistant tumors. In all probability Ringer's solution is equal to reveal a latent radiogenic injury of the permeability of the cell membrane. (auth)

12956

BIOLOGICAL INVESTIGATION ON RADIATION SENSITIZERS. Ruprecht Koch (Universität Freiburg i. B) and Heiligenberg-Instituts). Strahlentherapie 106, 273-6 (1958). (In German)

Several porphyrin compounds were investigated for their radiosensitivity effects on mice. It was concluded that hematoporphyrine does not change the radiosensitivity of mice. (C.H.)

12957

THE DISTRIBUTION OF RADIOACTIVITY FROM RAIN. Lloyd R. Setter and Conrad P. Straub (Robert A. Taft

Sanitary Engineering Center, Cincinnati). Trans. Am. Geophys. Union 39, 451-8(1958) June.

Under conditions similar to Cincinnati, Ohio, fallout is the result of rain-out and snow-out. Without precipitation there is little fall-out even though the particulate activity of surface air is abnormally high. Much of the suspended activity in cistern water from rain will be removed by sedimentation. Over 90% of both the suspended and dissolved fall-out becomes associated with soil and vegetation rather than appearing in surface waters. From the spring of 1953, to January, 1957, the fallout of Sr^{90} (Y^{90}) in Cincinnati, Ohio, is estimated to be at least ten and probably not more than 30 mμc per square meter of surface area. (auth)

Radiography

12958

LOCALIZATION OF INJECTED BONE MARROW CELLS BY AUTORADIOGRAPHY. T. T. Odell, Jr. and L. H. Smith (Oak Ridge National Lab., Tenn.). Acta Haematol. 19, 114-20(1958).

The distribution of labeled bone marrow cells injected into recipients has been observed by use of autoradiography. Many of the intravenously injected bone marrow cells were removed from circulation by the lungs, although other cells went to various sites such as the bone marrow, spleen, and thymus. Many of the injected, labeled cells found in the hematopoietic organs were metamyelocytes, although younger forms as well as mature polymorphonuclear leukocytes were also present. Some types of the injected, labeled cells were not found in the recipients; they may have been rapidly destroyed or may have quickly lost their label by rapid turnover of the labeled amino acid. (auth)

Radiotherapy

12959

THE BASIS OF THERAPY WITH RADIOACTIVE ISOTOPES. II. Marshall Brucer (Oak Ridge Inst. of Nuclear Studies, Tenn.). Atomkern-Energie 3, 261-5 (1958) July. (In German)

In this last section on the basis of radiotherapy the development of semimechanical placement is described. A discussion on the metabolic location of isotopes, especially radioiodine, completes the review. (J.S.R.)

12960

APPLICATION AND POSSIBILITIES OF THE BETATRON IN THERAPY. F. Wachsmann (Medizinische Universitatsklinik, Erlangen, Germany). Minerva Nucleare 2, 161-6(1958) May-June. (In Italian)

The 15-Mev betatron of the Medical Clinic of the University of Erlangen is described and illustrated in detail. The main characteristics relating to medical uses of high energy radiations are considered, and it is concluded that the introduction in therapeutics of these radiations will improve the results of tumor treatment as well as representing a technical progress. (auth)

Toxicology Studies

12961 AERE-Med/M-24

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

NOTES ON THE TOXICOLOGY OF FURFURYL ALCOHOL. Frances M. Turner. May 1958. 4p.

Brief details of the results of animal experiments covering inhalation, intravenous and oral administration of furfuryl alcohol are given. Information on its toxicity in man is not available but suggestions regarding therapy, based on animal experimentation, and maximum allowable concentrations are given. (auth)

12962 MAB-135-M

National Research Council. Materials Advisory Board. REPORT OF THE PANEL OF TOXICITY OF BERYLLIUM. July 31, 1958. Includes Reprint: HEALTH HAZARDS FROM BERYLLIUM. Merril Eisenbud. Reprinted from The Metal Beryllium published by The American Society of Metals, 1955. 29p. Contract DA-36-039-sc-76436.

A study of the sources of hazards from beryllium during its storage, fabrication, and testing of fabricated parts is reported. Permissible concentrations, handling precautions, and policing procedures are discussed. A recommended research program for further study of beryllium hazards in connection with its use in aircraft is outlined. (T.R.H.)

12963 NYO-8601

Cincinnati. Univ. Kettering Lab.

BIOLOGICAL EFFECTS OF BERYLLIUM AND ITS COMPOUNDS. Jules Cass, Frank Cleveland, and A. Wesley Horton. June 10, 1958. 44p. $7.80(ph OTS); $3.30(mf OTS).

Implantation of beryllium phosphor, prepared from zinc oxide, beryllium oxide and silica, beneath porcine skin resulted in a granuloma having characteristics similar, in some respects, to the granuloma observed in the skin of human beings. The lesion which developed after implantation of beryllium oxide and metallic beryllium was similar to that induced by the phosphor although it bore somewhat less resemblance to the human beryllium granuloma. Deprivation of sex hormones, administration of cortisone, injections of a chelating agent (versene), and of another compound (fluorapatite), in association with implantations of beryllium compounds failed to exert any influence upon the granulomatous response of porcine skin. Alteration of the properties of beryllium oxide and beryllium phosphor by etching the surface of the powders with hydrogen fluoride resulted in an immediate response of greater intensity, but did not alter the basic granulomatous lesion significantly. Beryllium oxide prepared by heating beryllium acetate induced a more intense localized tissue response and accelerated the onset of the ultimate granulomatous lesion. However, the nature of the granuloma was not altered histologically. (auth)

12964

THE DISTRIBUTION OF RADIO YTTRIUM AND RADIOACTIVE RARE EARTHS IN MAMMALS. I. DISTRIBUTION INVESTIGATION USING CARRIER FREE RADIO YTTRIUM Y^{91} IN GUINEA PIGS. Ernst Spode (Deutschen Akademie der Wissenschafter zu Berlin-Buch). Z. Naturforsch. 13b, 286-91(1958) May. (In German)

The distribution pattern of Y^{91} in guinea pigs following intracardial, intraperitoneal, and subcutaneous injections is reported. After the incorporation of the yttrium a special passage from the liver must be assumed to account for the accumulation in the bones. The high activities in the liver and kidneys require more radiobiological consideration. (tr-auth)

Tracer Applications

Refer also to abstract 13337.

12965 HW-56040
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
BUILDUP OF CHRONICALLY FED Cs^{137} IN THE RAT. J. E. Ballou and R. C. Thompson. May 13, 1958. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

Cesium-137 buildup in the rat was studied over a 500 day chronic feeding period. Tissue concentrations maintained during this period were in close agreement with the values predicted from an acute exposure experiment, and in close agreement with present assumptions employed in the calculation of maximum permissible concentrations. Concentrations of Cs^{137} in the gonads were about one-third of those in the critical organ, muscle. (auth)

12966
METHOD FOR STUDYING TRANSLOCATION OF SOME RADIOISOTOPES INTO ORGANS FROM SITE OF INJECTION. Horace Goldie, Harold D. West, Richard Freeman, and Robert Chess (Meharry Medical Coll., Nashville). Proc. Soc. Exptl. Biol. Med. 98, 604-8(1958) July.

Doses of 0.05 mc of $Y^{90}Cl_3$ solution and of $CrP^{32}O_4$ colloidal suspension in 0.05 or 0.1 ml were injected into ventral surface of tails in mice. At intervals of 1 minute to 3 days after injection, tails were serially amputated and preserved until 3rd day when every mouse was sacrificed; their organs (liver, lung, spleen, kidney), tails and heart blood (0.3 ml) were emulsified, dried and tested for radioactivity content with a Geiger Tube Detector. Results showed only a narrow range of radioactivity for each organ specimen calculated as a product of the average blood radioactivity in the same group of mice (amputated at the same time). The calculated and tabulated data show that a significant proportion of $CrP^{32}O_4$ was translocated into the liver from the tail; for Y^{90} the initial storage in the tail was very high, but some translocation occurred, presumably by excretion. The pattern of Y^{90} and $CrP^{32}O_4$ distribution in the body after injection into the tail was comparable to delayed results of intravenous injection; this resemblance was interpreted by high vascularization of the tail. It was concluded that the method of serial tail amputation may be useful for outlining the dynamics of isotopes spread in bodies of experimental animals. (auth)

12967
STRONTIUM/CALCIUM RATIOS IN PARTS OF RAT FEMUR. C. D. Van Cleave and C. T. Kaylor (Univ. of North Carolina, Chapel Hill). Proc. Soc. Exptl. Biol. Med. 98, 623-5(1958) July.

After intraperitoneal injection of a mixture of Ca^{45} and Sr^{89} in the rat, the Sr/Ca observed ratio in parts of a long bone, the femur, was obtained 15 minutes to 48 hours after injection. A maximal Sr content appeared in bone within 30 minutes, with the shaft showing discrimination against Ca; during the next 48 hours the observed ratios fell but remained consistently higher in shaft portions of the bone. Data on blood Sr/Ca ratios are also presented. (auth)

CHEMISTRY

12968 AD-137101
Duke Univ., Durham, N. C.
MICROWAVE AND RADIOFREQUENCY SPECTROSCOPY. STATUS AND TECHNICAL REPORT NO. 24 [FOR] FEBRUARY 1, 1958–MAY 1, 1958. Walter Gordy. 58p. Project Nos. 599-01-004 and TB2-0001. Contract DA-36-034-ORD-1233.

Research on free radicals naturally occurring in biological material is described. The free radicals are detected by their electron spin resonance. Electron spin resonance was also used to study radiation damage to proteins. (T.R.H.)

12969 AERE-C/M-342
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
THE DIFFUSION OF IODINE IN AIR. H. J. de Nordwall and R. H. Flowers. May 1958. 13p.

An experiment to measure the rate of diffusion of iodine vapor, at very low partial pressure, in air is presented. (W.L.H.)

12970 AERE-GP/R-2058(Pt. 2)
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
THERMAL DIFFUSION PLANT FOR THE ENRICHMENT OF HELIUM 3 FROM ATMOSPHERIC HELIUM. PART II. PERFORMANCE OF THE PLANT. R. W. Bowring and R. H. Davies. Mar. 1958. 43p.

An atmospheric helium thermal diffusion plant, capable of producing from atmospheric helium 2 cc NTP of Helium 3 per week at concentrations up to 10% He^3/He, has been operating for several years. It consisted of three metal columns, two of them identical coaxial-tube columns and the other a hot-wire column. In Part 1, experiments are described which were performed to determine the characteristics of the individual columns. In Part 2, the performance of the plant as a whole is described. The cost of the supply of atmospheric helium was an important factor in the final cost of the enriched helium and it was essential to strip the supply gas of its Helium 3 content as efficiently as possible. Experiments were performed, while production was in progress, to measure this stripping efficiency as a function of pressure and flow-rate and from these results the most economical operating conditions for the plant was obtained. An expression for the variation of stripping efficiency is deduced and compared with the experimental results. (auth)

12971 AFOSR-TN-58-515
Illinois. Univ., Urbana.
SOME STUDIES OF THE INTERACTION OF COBALT AND NICKEL WITH TITANIUM DIBORIDE. Report No. 81. Tracy A. Willmore and Dwight G. Bennett. Apr. 1958. 51p. Contract AF18(603)-28. (AD-158326).

When combinations of cobalt and titanium diboride are heated in the temperature range 1600 to 2750°F, chemical reaction occurs to produce titanium monoboride and cobalt boride. The observed tendency for cobalt and titanium diboride to persist is interpreted as a function of the ratios of these reacting constituents. Melting was detectable at temperatures as low as 2000°F and, for compacts containing 95 weight per cent cobalt–5 weight per cent titanium diboride, melting was essentially complete at approximately 200°F below the melting point of cobalt. Due to the number of phases formed, the mechanism of melting is probably not a simple process. It was established that boron is essential to produce low melting effects by substituting titanium for titanium diboride on a titanium-equivalent basis. Compacts of nickel and titanium diboride yielded

results which closely paralleled those obtained with cobalt and titanium diboride. Their melting characteristics, however, indicated that the slope of the liquidus is probably less steep than in the cobalt system. In both systems, a prevalent tendency for melt and solid fractions to separate makes it difficult to maintain homogeneous samples. Hence, equilibrium is difficult to establish. (auth)

12972 BMI-1062(Del.)
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING DECEMBER 1955. Russell W. Dayton and Clyde R. Tipton, Jr. Jan. 1, 1956. Decl. with deletions Mar. 6, 1958. 82p. Contract W-7405-eng-92. $13.80(ph OTS); $4.80(mf OTS).

Progress is reported on: physical and mechanical properties of Zr, Sn–Zr, U–Cr, U–Ti, and other U alloys; production of active UO_2; corrosion resistance of stainless alloys; development of refractory BeO fuel elements; physical properties of modified UO_2 compacts; transformation phases in U–Zr alloys; corrosion of U, Zr, and Zr alloys by water; intermetallic U compounds; and oxidation resistance of Nb alloys. (For preceding period see BMI-1057(Del.).) (C.W.H.)

12973 CF-58-7-56
Oak Ridge National Lab., Tenn.
INFLUENCE OF SURFACE ACTIVE AGENTS ON ThO_2 SLURRIES. C. S. Morgan. July 15, 1958. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

An analysis, based on electrical double-layer concepts, of the influence of surface active agents on ThO_2 slurry properties indicates that under reactor conditions the use of additives to obtain certain slurry properties such as low yield stress will not be effective. Corrosion ions, fission ions, and ions resulting from radiation will compress the electrical double layer on the particle surface and reduce its dispersing effect. Elevated temperatures will also work against effective double layer properties, primarily through effect on the dielectric constant. Colloidal suspensions under conditions encountered in a reactor are unstable and accordingly stable slurry properties dependent on the surface condition are unlikely to exist. Similar arguments suggest that ceramic or other surface coatings on ThO_2 particles probably would not strongly influence slurry properties in a reactor. Evidence, as yet inconclusive, suggests that electrolyte additives, which prevent cake formation in slurries where it otherwise would be expected, act through influence on the rate and nature of primary particle degradation. (auth)

12974 DP-297
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
DISSOCIATION OF NITRIC ACID IN ALUMINUM NITRATE SOLUTIONS. Robert C. Axtmann and Bruce B. Murray. June 1958. 11p. Contract AT(07-2)-1. $0.50(OTS).

The proton magnetic resonance spectra of the HNO_3–H_2O–$Al(NO_3)_3$ system indicate that the dissociation of nitric acid is repressed significantly by aluminum nitrate. Values for α, the dissociation constant of nitric acid, obtained from these spectra, are given as a function of aluminum ion concentration and of nitric acid concentration. (auth)

12975 LA-2176
Los Alamos Scientific Lab., N. Mex.
SURVEY OF ORGANIC COMPOUNDS AS PRIMARY SCINTILLATION SOLUTES. A Status Report. F. N. Hayes, V. N. Kerr, D. G. Ott, E. Hansbury, and B. S. Rogers. Jan. 11, 1958. 24p. Contract W-7405-eng-36. $0.75(OTS).

A survey is presented of organic compounds for their ability to function as primary solutes in a toluene–solvent liquid scintillator system. A table is included which contains testing results for 483 solutes. (W.L.H.)

12976 NAVSHIPS-250-346
Bureau of Ships.
CHEMICAL RESISTANCE OF PLASTICS. Bureau of Ships Handbook. [Mar. 1954.] 471p.

Twenty-five rigid plastic materials were immersed in each of fifteen different chemical agents in a short preliminary compatibility test of one week at room temperature. The tests in which a specimen dissolved, delaminated, or otherwise deteriorated were discontinued. The data from the compatibility tests as well as from the long-term immersions are tabulated. The tested materials were: glass-fiber-filled alkyd, butadiene-styrene copolymer (2 specimens), cellulose acetate, cellulose acetate-butyrate, epoxy (2 specimens), Exon, Kel-F, melamine glass laminate, methyl methacrylate, nylon, phenolic laminate (3 specimens), polyester glass laminate, polyethylene, polystyrene, polyvinyl chloride-acetate flexible and rigid copolymer, polyvinyl chloride rigid unplasticized, polyvinylidene, silicone glass laminate, styrene-acrylonitrile copolymer, and Teflon. The chemical agents used were HF, HNO_3–H_2SO_4, H_2SO_4, HNO_3, tert-butyl mercaptan, C_2H_5OH, JP-3 fuel, Navy Special Fuel Oil, aircraft hydraulic fluid, H_2O_2, and monoethyl aniline. (T.R.H.)

12977 NP-6838
General Electric Co. General Engineering Lab., Schenectady, N. Y.
EVALUATION OF EXPERIMENTAL POLYMERS FOR DIELECTRIC APPLICATIONS. A PRELIMINARY EVALUATION OF DIFFERENTIAL THERMAL ANALYSIS AS A MEANS OF DETERMINING THERMAL STABILITY OF ORGANIC POLYMERS. First Quarterly Progress Report for April 24, 1958 to July 5, 1958. C. D. Doyle and J. A. Hill. July 15, 1958. 38p. Project No. 8-(8-7371). Contract AF33(616)-5576.

The differential thermal analysis technique and experimental apparatus are described in detail. Results of preliminary tests of some conventional polymers and some specially prepared high-temperature polymers are presented and discussed. Future work is discussed briefly. (auth)

12978 NRL-5091
Naval Research Lab., Washington, D. C.
ELECTROCHEMICAL MECHANISMS OF NOBLE-METAL/HYDROGEN SYSTEMS. Part I. PLATINUM. S. Schuldiner. Dec. 20, 1957. 38p. Project Nos. NR-475-000 and NS-677-100.

This report is the first of a series reviewing the experimental and theoretical findings of the electrochemical mechanisms of noble-metal/hydrogen systems. The kinetic equations of hydrogen-producing reactions are derived; experimental techniques are discussed, including the use of an electronic current interrupter developed at this Laboratory; and results from studies of the electrode mechanisms of platinum are reported. (auth)

12979 AEC-tr-2518
DISORDER-EQUILIBRIA IN SEMICONDUCTING CRYSTALS IN TERMS OF THE MASS ACTION LAW. K. Hauffe. Translated from Vol. 1, p.107-27 in "Halbleiterprobleme," Walter Schottky, ed. Friedr. Vieweg und Sohn (Braunschweig) 1954. 26p.

This mass action law follows from thermodynamic

assumptions (particularly of the μ-thermodynamic) if the statistical term of all the chemical potentials is made proportional to the natural logarithm of the mole fraction or the lattice concentration. Kinetically this means that all particles, in homogeneous as well as heterogeneous systems, are assumed to react with each other in independent, individual reactions, resulting in the forward and reverse reactions to be proportional with concentrations of partial pressures as exponentials. The law of mass action has to be combined with the conditions of electrical neutrality. This combination becomes particularly apparent when dealing with heterogeneous phase mixtures where, for example, divalent cations or anions are inevaporated into the host lattice of univalent ions. (W.L.H.)

12980 AEC-tr-3255

THE DYNAMICS OF CHEMOSORPTION IN BUBBLING COLUMNS. V. B. Fal'kovskii, Yu. I. Mel'nikov, and A. V. Vetrova. Translated from Zhur. Priklad. Khim. 30, 1760-3(1957). 7p.

An investigation was made of the effect of the size of the bubbling columns and the gas rate on the degree of absorption of olefins in alkali processes by bubbling ethylene and propylene through liquid benzene in the presence of 5 wt. % anhydrous aluminum chloride at 80° and at atmospheric pressure and on the polymerization of isobutylene, bubbling through a layer of 87% sulfuric acid, at atmospheric pressure and 100°. The absorption dynamics of oxygen was also investigated by bubbling air through a layer of liquid butyraldehyde in the presence of 0.1 wt. % magnesium acetate at 13 ± 3° and at atmospheric pressure. The results are graphed. (J.S.R.)

12981 AEC-tr-3323

DIPHENYL, ITS CHARACTERISTICS, EMPLOYMENT AND PRODUCTION. (Difenyl, dess Egenskaper, Användning och Framställning). Allan Dahlen. Translated for Atomics International from Iva. 19, 134-9 (1948). 9p.

The physical and chemical properties of biphenyl are outlined. Experience in production on a laboratory scale and on a semi-industrial scale is summarized. (T.R.H.)

12982 SCL-T-171

THERMAL OXIDATION OF CHROMIUM OXIDE AND DISSOCIATION OF CALCIUM CHROMATES. (Termicheskoe Okislenie Okisi Khroma i Dissotsiatsia Khromatov Kal'tsia.) F. I. Vasenin. Translated by M. I. Weinreich (Sandia Corp.) from Zhur. Priklad. Khim. 21, 429-36(1948). 16p.

A heating of mixtures of chromium oxide with calcium oxide, as well as of monochromites and oxychromites of calcium in an oxidizing medium at temperatures ranging from 600 to 700°C, is accompanied by an oxidation of trivalent chromium, i.e., its transition into a hexavalent chromium, in other words the result is a formation of chromates. Further heating of calcium chromates in the same gaseous medium, at a temperature above 1040°C, brings about a dissociation: the calcium bichromate, without forming any intermediary compounds, changes into a monochromite. The calcium chromate disintegrates into a monochromite and a tricalcium oxychromite. The tricalcium bichromate decomposes, thus forming intermediate chromate-chromites. (auth)

12983

EFFECT OF METHYL ALCOHOL ON THE LUMINESCENCE PROPERTIES OF SOLUTIONS USED IN SCINTILLATION COUNTERS. A. Kuhn and J. Mojzis. Ceskoslov. časopis. fys. 6, No. 1, 60-3(1956). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1326.)

The luminescence characteristics of p-terphenyl (I) and 1,4-diphenyl butadiene (II) in binary systems consisting of methyl alcohol (III) with benzene (IV), toluene (V), or xylene (VI) have been investigated. Luminescence (L) was induced by an α-radiating Po source. The highest intensity (i) of L was observed for I when V was used as a solvent and the least when the solvent was IV; i decreases with increasing temperature. An increase in the concentration of I leads to an increase in i; i is practically constant at concentration of I exceeding 0.5%. III reduces i but does not change the appearance of the L spectrum, which shows a maximum at λ380 mμ. For concentrations of III of 30% i is reduced by 35%. An increase of 10° in the temperature reduces i by 10%. The luminescence yield is considerably greater when I and the solvent are luminescently pure. The presence of water causes only an insignificant decrease in i. The i of the L of II is considerably smaller, the greatest value being observed in VI solutions; III reduces the i of L of II to a greater extent than in the case of I. A 0.5% solution of luminescently pure I in the system III-V containing 30% III increases the sensitivity of the counter to β radiation by a factor of 18.5 compared to the Libby counter (W. F. Libby, Radiocarbon Dating, Chicago, University of Chicago Press, 1952).

12984

PHASE TRANSFORMATIONS IN THE SODIUM SULPHATE—SODIUM CARBONATE SYSTEM. A. N. Khlapova (Kurnakov Inst. of Organic Chemistry, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 119, 1167-9(1958) Apr. 21. (In Russian)

Phase analysis of $Na_2CO_3 \cdot Na_2SO_4$ was made using simultaneously the differential-thermographic, x-ray diffraction, and crystallo-optical methods. It was found that α, β, ϵ, γ', and α' solid phases and binary salts of $Na_2CO_3 \cdot 9Na_2SO_4$, $Na_2CO_3 \cdot 2Na_2SO_4$, and $3NaCO_3 \cdot Na_2SO_4$ are stable in the absence of moisture; in the presence of aqueous vapors or in atmospheric conditions the system becomes unstable, due to the interaction with H_2O vapors. It was revealed that the Na_2CO_4—Na_2SO_4 system in the presence of aqueous vapors transforms from a two component to a three component state and the phase equilibrium diagram transforms to Na_2CO_3—Na_2SO_4—H_2O. (R.V.J.)

12985

THE CONDUCTANCES OF SOME CHLORIDES IN ETHANOL. PART I. HYDROCHLORIC ACID, CAESIUM CHLORIDE, MAGNESIUM CHLORIDE, AND LANTHANUM. A. M. El-Aggan, D. C. Bradley, and W. Wardlaw (Birkbeck Coll., London). J. Chem. Soc. 2092-9(1958) June.

The conductances of very dilute solutions of hydrochloric acid, cesium chloride, magnesium chloride, and lanthanum chloride have been measured in anhydrous ethanol at 25°C. Some measurements on magnesium chloride solutions at 20°C were also obtained. The effects of traces of water on the conductances of cesium chloride and magnesium chloride were determined. Hydrochloric acid and cesium chloride behave as strong electrolytes exhibiting ion-association in accordance with theory. The behavior of magnesium chloride or lanthanum chloride is not unambiguously determined by conductance measurements because of the possibility of solvolysis but they are not strong electrolytes. (auth)

12986

ELECTROCHEMICAL MEASUREMENT OF OXIDE FORMATION. Douglas G. Hill, Bernard Porter, and

Arthur S. Gillespie, Jr. (Duke Univ., Durham, N. C.). J. Electrochem. Soc. 105, 408-12(1958) July.

Measurements have been made of the potential developed between a metal wire covered with its oxide and a platinum wire over which air or oxygen was passed. The electrolyte was the eutectic mixture of Li_2SO_4 and K_2SO_4, containing dissolved CaO and operated at various temperatures between 550° and 750°C. Heavy metal oxides are only very slightly soluble in this melt, so that the measured potential corresponds to the formation of metal oxide from the elements. Iron probably formed FeO, nickel formed NiO below 658° and probably a solid solution of $LiNiO_2$ in NiO at higher temperatures, while copper formed Cu_2O. Gold showed only the thermoelectric potential expected. The values found are in agreement with the free energy of formation of the oxides as determined by other methods. (auth)

12987

INVESTIGATION OF THE HYDRAULIC CHARACTERISTICS OF PEAT WITH THE AID OF RADIOACTIVE ISOTOPES. M. P. Volarovich, N. V. Churayev, and B. Ya. Minkov. Kolloid. Zhur. 19, No. 2, 159-66(1957). (Translated from Referat. Zhur. Mekh. 1957, No. 11, p. 94)

12988

SOLID FUELS VIE FOR PROPELLANT LEAD. Alfred J. Zaehringer. Missiles and Rockets 4, No. 6, 28-9, 31-2, 34, 37(1958) Aug. 11.

The types of fuels to be used for a given solid propellant rocket are considered. Methods of production, constituents of the fuels, and special machinery for the production of fuels are included. (W.L.H.)

12989

OBTAINING AND INVESTIGATING CERTAIN PROPERTIES OF CERAMICS FROM SILICON NITRIDE. I. S. Brokhin and V. F. Funke. Ogneupory No. 12, 562-6 (1957). (In Russian)

The silicon–nitrogen system has three phases: Si_3N_4, Si_2N_3, and SiN. The Si_3N_4 phase with 39.5% nitrogen is chemically the most stable. The properties and method of preparation of SiN are described in detail. The saturation curve of nitrogen in silicon was obtained for various temperatures. The nitrogen content of silicon was determined as a function of the nitration time at 1600°. The effect of the addition of silicon on the sintering of the nitride was investigated. Bending strength and oxidation resistance were tested as a function of temperature. (J.S.R.)

12990

DEVELOPMENT AND RECENT STATE OF TECHNOLOGY OF RUBIDIUM AND CESIUM AND OF THEIR COMPOUNDS. V. E. Plyshchev and I. V. Shakhno. Uspekhi Khim. 26, No. 8, 944-64(1957). (Translated from Referat. Zhur. Khim. No. 1, 1958, Abstract No. 666.)

Aerosols

12991 AECU-3781

General Mills, Inc., Minneapolis.

UPPER ATMOSPHERE MONITORING PROGRAM. Quarterly Report Covering Period October 1, 1957 thru January 31, 1958. Report No. 1863. Sidney Stern, Sam Jones, Al Schekman, and Robley Stuart. June 13, 1958. 26p. Contract AT(11-1)-401. $4.80(ph OTS); $2.70(mf OTS).

An apparatus designed to test aerosol filter efficiency at pressures equal to or less than atmospheric and at linear face velocities of 5 to 1000 ft/min is described. Aerosol collection efficiency studies were completed for IPC paper at 20,000 and 40,000 ft. Data developed in these studies indicate that in the impaction and diffusion regions collection efficiency increases with altitude for all linear face velocities less than 800 ft/min. A propeller-type flowmeter, calibrated to measure the volume of air moved by a blower in a balloon-borne system, was flown on five separate flights to obtain air flow data. These data are presented. Flowmeter air flow measurement data were approximately 10% lower than telemetered data. (auth)

12992 PTP-561

Gt. Brit. Chemical Defence Research Establishment, Sutton Oak, Lancs, England.

MEASUREMENTS OF THE SHORT RANGE DIFFUSION OF AIRBORNE PARTICLES AT A HEIGHT OF A FEW HUNDRED FEET IN THE ATMOSPHERE. J. S. Hay and F. Pasquill. Aug. 25, 1956. 19p.

The results of measurements of the vertical distribution of airborne particles, released usually at a height of 500 feet, and sampled for periods of about 30 minutes at downwind distances of 100, 300, and 500 meters, are presented and discussed. (auth)

12993

THE STUDY OF ALPHA-RADIOACTIVITY IN THE AIR WITH THE AID OF A QUICK-ACTING IONIZATION CHAMBER. U. Fachin and A. Mal'visini. pp. 274-8 in "Dozimetriya ioniziruyushchikh izlucheniy." Moscow, Gostekhteoretizdat, 1956. (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1324.)

It has been found that oxygen contamination (~0.25%) of the Ar–N_2 filler gas of a rapid-response ionization chamber (BIK) has practically no effect on the amplitude of the pulse at voltages exceeding a certain value. The linearity of the BIK is not impaired. A study was made of the α-particle spectrum of radioactive dust deposited on the plate of the electrostatic precipitator. The background of the BIK is ~one pulse/min. When an amplitude analyzer with 5 to 6 pulse-recording channels is used in the investigation of the α-particle spectrum, an α radioactivity of $\sim 5 \times 10^{-13}$ curies can be detected in one cubic meter of air.

Analytical Procedures

12994 AERE-C/R-2527

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE ANALYSIS OF THORIUM–MAGNESIUM BINARY ALLOYS. G. W. C. Milner and J. W. Edwards. Apr. 1958. 7p. $0.32(BIS).

Procedures are presented for the determination of thorium and magnesium in their binary alloys. Thorium is determined by direct titration with EDTA at pH 2.5 to 3 using xylenol orange as indicator. Magnesium is also titrated directly with EDTA at pH 10.3 after precipitating the thorium as its peroxide in acid solution. Solochrome black 6B (C.I. 201) is used as the indicator. (auth)

12995 AERE-MED/R-2586

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

ORGANIC AND INORGANIC URINARY EXCRETION VALUES IN NORMAL AND IRRADIATED SUBJECTS INCLUDING OBSERVATIONS ON THE PRESERVATION OF THE URINE SAMPLE. C. Sanders, P. C. Long, and D. H. Pinnock. May 1958. 12p.

This paper deals with the problems associated with the collection and preservation of twenty-four hour urine samples, with base line excretion levels in normal subjects and some organic and inorganic excretion values on ten patients undergoing radiotherapy. (auth)

12996 CF-56-7-106(4th Issue)
Oak Ridge National Lab., Tenn.
NEUTRON ACTIVATION ANALYSIS. G. W. Leddicotte and S. A. Reynolds. July 22, 1958. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The program of neutron activation analysis service at Oak Ridge National Laboratory is described. The techniques used, the limits of measurement, and the general applications of the method are discussed. (T.R.H.)

12997 KAPL-M-RES-2
Knolls Atomic Power Lab., Schenectady, N. Y.
A MASS SPECTROMETER EXAMINATION FOR VOLATILE IMPURITIES IN A SAMPLE OF DISTILLED MERCURY. R. E. Schofield. Feb. 1, 1950. 7p. Contract [W-31-109-Eng-52.] $1.80(ph OTS); $1.80(mf OTS).

A mass spectrometric study of the most likely metallic impurities in eight-times distilled mercury (Cu, Cd, Zn, Ag, Au, Pt metals) indicates that they are not present to a degree greater than 1 part in 90,000. (T.R.H.)

12998 NLCO-742
National Lead Co. of Ohio, Cincinnati.
DETERMINATION OF THORIUM IN URANIUM ORES AND FEEDS BY SOLVENT EXTRACTION EMPLOYING THENOYLTRIFLUOROACETONE. Paul G. Laux and Ernest A. Brown. May 23, 1958. 27p. Contract AT(30-1)-1156. $1.00(OTS).

The thenoyltrifluoroacetone (TTA) extraction method has been investigated for the determination of microgram concentrations of thorium in uranium ores and concentrates. The tolerance limits for eighteen elements commonly found in uranium ore concentrates were established. The effect of phosphate on extraction of thorium was studied. Cobalt, copper, tin, and bismuth were found to seriously interfere with the Thoron method for the determination of thorium after a TTA extraction. A TTA extraction method is described for the separation of thorium and uranium from the interfering ions, employing preliminary acid sulfide and ammonium hydroxide separations. The method is rapid, and results obtained compare favorably with results obtained with other procedures. (auth)

12999
THE DETERMINATION OF TUNGSTEN IN TITANIUM, ZIRCONIUM, AND THEIR ALLOYS. D. F. Wood and R. T. Clark (Imperial Chemical Industries, Ltd., Kynoch Works, Witton, Birmingham, Eng.). Analyst 83, 326-34(1958) June.

To fulfill the need for satisfactory methods for the determination of tungsten over the range 0.002 to about 1% in titanium and its alloys, two absorptiometric procedures were developed, and subsequently extended to the examination of zirconium and its alloys. A direct procedure, based on the yellow color produced by the reaction of reduced tungsten with thiocyanate ions, is suitable for the determination of tungsten from 0.05 to 1.6% in titanium and many of its alloys, and from 0.01 to 1.6% in zirconium and its alloys; larger amounts can be determined by using a smaller sample weight. The procedure is simple and rapid, and is also suitable for application on a routine basis. Vanadium and molybdenum interfere, and, when these metals exceed specified limits, the toluene-3:4-dithiol procedure is recommended. A procedure, which depends on the formation of a bluish green complex with toluene-3:4-dithiol, is applicable to the determination of tungsten in both titanium and zirconium-bearing materials over the range 0.002 to 0.8%. Vanadium does not interfere, and interference by molybdenum is overcome by means of a preliminary sulfide separation. (auth)

13000
A POTENTIAL SOURCE OF SAMPLING ERROR IN THE DETERMINATION OF NITROGEN IN TITANIUM ALLOYS. J. D. Hobson and D. Swinburn (Hadfields, Ltd., East Hecla Works, Sheffield, Eng.). Analyst 83, 376-7 (1958) June.

Serious contamination by nitrogen can be caused during preparation of titanium alloys by drilling or milling in the manner customary for the sampling of metals. With all drills it was found that with each successive hole drilled the apparent nitrogen content increased. The results show that in order to avoid nitrogen contamination it is essential to drill at low speeds, with a relatively coarse feed using freshly sharpened bits. (J.R.D.)

13001
LIQUID SCINTILLATION COUNTING OF C^{14} AND H^3 IN PLASMA AND SERUM. Philip S. Chen, Jr. (National Heart Inst., N.I.H., Bethesda, Md.). Proc. Soc. Exptl. Biol. Med. 98, 546-7(1958) July.

A liquid scintillation technic for counting total plasma or serum activity of C^{14} and H^3 is described. The serum is complexed by the quaternary ammonium base, Hyamine, and dissolved in phosphor-containing toluene with the addition of ethanol. Correction for quenching is effected by recounting an added internal standard after determination of the observed count. The method was shown to be rapid and accurate for various volumes of serum. (auth)

Crystallography and Crystal Structure

13002 NAA-SR-2693
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
CRYSTAL GROWTH: A COMPREHENSIVE BIBLIOGRAPHY OF JOURNAL ARTICLES AND UNCLASSIFIED REPORTS 1951–1957. F. G. Bennett, IV. June 15, 1958. 38p. Contract AT(11-1)-GEN-8. $1.00(OTS).

13003
MELTED LAYER CRYSTAL GROWTH AND ITS APPLICATION TO GERMANIUM. F. H. Horn (General Electric Co., Schenectady, N. Y.). J. Electrochem. Soc. 105, 393-5(1958) July.

Single-crystal material of constant impurity distribution may be grown conveniently from a doped melted layer maintained above solid retained in a crucible. As crystal is withdrawn from the melt, fresh material is supplied to the melted layer by moving the melted layer downward through the solid. A single crystal may be grown using direct high-frequency coupling to heat the melted layer if fluctuating components of the field are removed. Data are given for resistivity profiles of germanium crystals doped with antimony and grown with manual operation of the heaters. (auth)

13004
MEASUREMENTS OF THE NUMBER OF ION TRANSITIONS IN SODIUM–COBALT SILICATE. V. I. Malkin and V. V. Pokidyshev (Central Scientific Research

Inst. of Ferrous Metallurgy). Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 5, 129-31(1958) May. (In Russian)

The number of ion transitions, Na^+ and Co^{2+}, in $CoO \cdot 2Na_2O \cdot 6SiO_2$ was measured. In this system the ratio O:Si is similar to $CaO \cdot Na_2O \cdot 4SiO_2$ but the molar concentration of Na_2O is twice that of the CoO. The experiments were made at 1200°C. The number of transitions of the Na^+ ion is close to unity and of Co^{2+} ion is close to zero. (R.V.J.)

13005

STUDIES ON THE LOWER OXIDES OF TITANIUM. A. David Pearson (Massachusetts Inst. of Tech., Cambridge). Phys. and Chem. Solids 5, 316-27(1958).

Pure TiO is face-centered cubic above ~950°C. The structure of samples annealed below this temperature is complex, consisting of two or possibly three phases not in equilibrium. Impurities and excess of oxygen stabilize the face-centered cubic form at room temperature. The electrical resistivity of TiO (prepared by melting) is 2.81×10^{-4} Ω cm at room temperature, and increases with temperature between −162 and 362°C. The thermoelectric emf of TiO is of the same order of magnitude as that of metals. The measured density is less than the x-ray density, indicating that 14.6% of the lattice positions are unoccupied. The properties suggest that the TiO-phase oxides may be considered solid solutions of oxygen in titanium. X-ray investigations indicate that Ti_3O_4 probably does not exist. The trigonal unit cell of Ti_2O_3 between room temperature and 350°C is confirmed. The lattice parameters change rapidly between 160 and 200°C, corresponding to the rapid increase in magnetic susceptibility. Ti_2O_3 is antiferromagnetic; $\chi_m = 1.09 \times 10^{-6}$ cgs units at 20°C. The thermal activation energy of electrical conduction of Ti_2O_3 in the room-temperature region is about half of the observed optical activation energy. The material is p-type semiconductor at room temperature. (auth)

13006

THE EFFECT OF PRESSURE ON COLOR CENTERS IN ALKALI HALIDE CRYSTALS. W. G. Maisch and H. G. Drickamer (Univ. of Illinois, Urbana). Phys. and Chem. Solids 5, 328-36(1958).

The absorption spectra of both x-irradiated and additively colored alkali halides were studied under pressure up to 50,000 atm. These experiments were conducted at room temperature and, with a few exceptions, only those bands occurring in or near the visible region of the spectrum were studied. Frequency shifts and bleaching effects, the latter induced both by radiation and by plastic deformation, were observed. An apparently new band, intimately related to the F center and appearing at the expense of the F band, has been studied. Several related experiments were run at 1 atm. It is shown that atmospheric oxidation is one of the mechanisms responsible for the bleaching of plastically deformed crystals. (auth)

Deuterium and Deuterium Compounds

13007

ISOTOPE SEPARATION IN THE FREEZING OF WATER AND DIFFUSION CONSTANT OF D AND O^{18} IN ICE WITH DISCUSSION OF THE POSSIBILITY OF A MULTIPLICATION OF THE ISOTOPE SEPARATION APPEARING DURING FREEZING IN A HAIRPIN COUNTER CURRENT DEVICE. W. Kuhn and M. Thürkauf (Univ. of Basel). Helv. Chim. Acta 41, 938-71(1958). (In German)

In the stepwise crystallization of water an enrichment of both HDO contained in water and of H_2O^{18} in the crystalline phase occurs. It was shown that the enrichment in the crystalline phase was detected by a separation parameter which could be calculated from the melting point difference of HDO and H_2O or H_2O^{16} and H_2O^{18} as well as from the heat of fusion and the absolute fusion temperature. For the case of deuterium or O^{18} enrichment the separation parameter was experimentally determined. An HDO enrichment of $\delta_{E,W} = 1.71 \times 10^{-2}$ was obtained in good agreement with theoretical values. For the enrichment of H_2O^{18} a value of $\delta_{E,W} = 5 \times 10^{-4}$ was obtained. The calculated fusion temperature of H_2O^{18} was + 0.05°. It is possible to multiply the small separation effect observed in the stepwise crystallization of water in a hairpin counter current system. For the conditions under which a practical multiplication could be obtained, the magnitude of the diffusion coefficient for D or O^{18} in ice is essential. These diffusion coefficients were experimentally determined from −1.5 to −2°. They are, within the error limits, identical for D and O^{18} and have the value $D = 1.0 \times 10^{-10}$ cm²/sec. On the basis of the measured separation parameter and the diffusion coefficients, the possibility for a multiplication of the isotope separation by a hairpin counter current method was discussed. (tr-auth)

Fluorine and Fluorine Compounds

13008 CF-58-6-86

Oak Ridge National Lab., Tenn.

VOLATILITY STUDIES OF SOME FISSION PRODUCT FLUORIDES. W. A. Brooksbank, Jr., R. J. Carter, and M. F. Osborne. June 25, 1958. 22p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A preliminary study of the volatility behavior of molybdenum indicated that MoF_5 was converted to MoF_6 by F_2; MoF_6 and Tc fluoride are absorbed on NaF at 100°; technetium fluoride is more strongly held than molybdenum fluoride on NaF; MoF_6 may not be completely trapped by a dry ice trap. The behavior of volatile fission product fluorides was such that (a) Ru and Nb fluorides were volatile from fused salts during fluorination, (b) Mo and technetium were not volatile during hydrofluorination but were in excess F_2 > 100°C. (auth)

13009 WADC-TR-55-220(Pt. IV)

Peninsular ChemResearch, Inc., Gainesville, Fla.

DEVELOPMENT OF FLUORO-SILICONE ELASTOMERS. Summary Report [for] December 15, 1956 to December 15, 1957. Byron H. Wise. Dec. 13, 1957. 29p. Project title: RUBBER, PLASTIC AND COMPOSITE MATERIALS. Task title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-3238.

Fluoroalkylsilane monomers and polymers were prepared for use as high-temperature and aircraft fuel-resistant elastomeric materials. The compounds prepared were bis(trifluoropropyl)dichloro-silane, (chlorohexafluorocyclobutylethyl)-methyldichlorosilane, and (2-trifluoromethyltrifluoropropyl)-methyldichlorosilane. Polymerization of the cyclic polymers of (pentafluorobutyl)-methylsiloxane and (heptafluoropentyl) methylsiloxane was attempted, but resulted in oils of lower viscosity than desired. Polymerization of the cyclic polymers of (trifluoropropyl) methylsiloxane yielded high viscosity oils and in one case an elastic gum was formed. (J.R.D.)

Graphite

Refer also to abstracts 13024 and 13482.

13010 HW-55211-RD(Del.)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

IRRADIATION ANNEALING IN GRAPHITE. II. ACTIVATION PROCESSES. J. R. Townsend and R. E. Nightingale. Feb. 26, 1958. Decl. with deletions Mar. 11, 1958. 10p. Contract W-31-109-Eng-52. $1.80 (ph OTS); $1.80(mf OTS).

The rate of annealing due to primary neutron-carbon atom collisions transferring 3 to 25 ev to the recoil atoms is much too slow to account for irradiation annealing rates observed in pile annealing experiments. It is necessary to assume that much of the annealing is accomplished by the slowing down of carbon atoms produced by high energy neutrons. The fraction of primary recoil energy going into annealing reactions is estimated to be about four per cent. Irradiation annealing occurs before vibrational equilibrium is established with the lattice and should not be considered as equivalent to additional thermal annealing. Irradiation damage to the properties of graphite should saturate when the irradiation damage rate equals the irradiation and thermal annealing rates. The effects of irradiation annealing on the damage distribution function are discussed. (auth)

13011 JPL-Pub.-122

California Inst. of Tech., Pasadena. Jet Propulsion Lab.

HEAT-FLUX RUPTURE WITH INTERNAL HEAT GENERATION OF GRAPHITES PREPARED BY LOS ALAMOS SCIENTIFIC LABORATORY OF THE UNIVERSITY OF CALIFORNIA. W. P. Powell. Feb. 27, 1958. 106p. Contract DA-04-495-Ord-18.

Specimens of a commercial graphite and of three grades of graphite fabricated by the Los Alamos Scientific Laboratory of the University of California were subjected to thermal stress sufficient to cause failure. The specimens, in the form of thin strips, were heated internally by an electric current and cooled at the surfaces by a high velocity nitrogen gas stream. Failure by thermal stress, evidenced by a clean break or by shattering of the specimen, could be produced at specimen surface temperatures up to approximately 5500°R. At higher temperatures the specimens failed by plastic deformation. Data are presented in the form of surface heat flux vs surface temperature for the one-eighth-inch-thick specimens. The Speer Carbon Co. No. 3499 graphite tested as a reference material failed at a surface heat flux of 5 to 6 Btu/in.^{2}sec up to surface temperatures of 5600°R, beyond which temperature plastic failure occurred. The Los Alamos "CK" grade graphite was a base material, while the "LDH" grade graphite was loaded with 0.125 grams of natural uranium per cubic centimeter, and the "LDC" grade was loaded with 0.250 grams of natural uranium per cubic centimeter. The addition of uranium to the graphite decreased the electrical resistivity and increased the maximum heat flux before failure. The Los Alamos "CK" graphite appeared to have a coarser grain structure and be more porous than the 3499 graphite, and it fractured at appreciably lower heat flux. The "LDC" loaded graphite was approximately equivalent to the 3499 graphite in electrical resistivity and in limiting surface heat flux at elevated temperature. (auth)

13012 NAA-SR-2457

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

LOW-TEMPERATURE IRRADIATION AND ANNEALING EXPERIMENTS IN GRAPHITE. S. B. Austerman. July 15, 1958. 25p. Contract AT-11-1-GEN-8. $0.75(OTS).

Recent measurements of physical property changes in graphite exposed to nuclear radiation at temperatures near that of liquid nitrogen, and during subsequent thermal annealing, showed considerably more damage occurred and remained at this low temperature than during room-temperature irradiation. To provide more information for formulating and testing radiation damage and annealing models, further experiments were performed. The experiments included: electron irradiation of graphite near 4°K, followed by measurement of the electrical resistivity changes due to annealing at temperatures up to room temperature; neutron irradiation at temperatures below 125°K, followed by measurement of the annealing-out of radiation-induced crystallographic c-axis expansion at temperatures up to room temperature. In addition calculations based on previous stored-energy release experiments have been applied to a proposed model of interior-to-boundary diffusion of lattice defects to test plausibility of the model. The results of these experiments and calculations are discussed in relation to a recently proposed model for explaining radiation damage and thermal annealing. (auth)

13013 NAA-SR-Memo-1903

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

GRAPHITE EXPERIMENTS IN THE SRE. W. K. McCarty and J. J. Gill. May 14, 1957. 33p. $6.30 (ph OTS); $3.00(mf OTS).

A series of experiments is being conducted in the SRE to determine the effects of irradiation on TSP graphite under SRE operating conditions. Nine experimental assemblies are involved, four of which have thermocouples and gas lines which extend through the reactor shield. The gas lines run to a common manifold and vacuum system. To avoid confusion the experiments are discussed here as though they were independent and some of the text is repeated in different sections. The pressures presented herein are newly calculated values which take into consideration the atmospheric pressure at the SRE site and stress calculations which were made subsequent to the review of these experiments by the SRE Experimental Review Committee. (auth)

13014 AEC-tr-3320

GRAPHITE IN REACTOR CONSTRUCTION. V. V. Goncharov. Translated by Lydia Venters for Argonne National Lab. from Atomnaya Energ. 3, 398-408(1957). 23p.

Requirements of graphite for reactor application and the fundamental physical and chemical properties of graphite and graphite materials are discussed. The manufacturing technology of graphite for reactors in Britain, France, U.S.A., and U.S.S.R. is described. Changing of properties of graphite due to the radiation effects in reactors is discussed. (W.D.M.)

13015

ADSORPTION OF AMMONIA ON GRAPHITIZED CARBON BLACK. A. A. Voskresenskii (Inst. of Physical Chemistry, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 119, 724-6(1958) Apr. 1. (In Russian)

Measurements were made of the ammonia vapor adsorption at −36.3° on carbon black which was calcined for 2 hours at 1700°. The obtained isotherm of the adsorption is presented graphically. (R.V.J.)

13016

ELECTRONIC STRUCTURE AND DIAMAGNETISM OF GRAPHITE. Shoichi Mase (Univ. of Nagoya, Japan). J. Phys. Soc. Japan 13, 563-73(1958) June.

The electronic energy bands of graphite were studied by the Bloch method, and the diamagnetic susceptibility was calculated. The calculated value of the main term in Peierls' constant susceptibility is about 0.3 times the experimental value, and the theoretical value of periods of two types with regard to the de Haas-van Alphen effect is about 2.5 times the experimental value. The cause of such discrepancy is discussed. (auth)

Laboratories and Equipment

13017 ANL-4670(Del.)

Argonne National Lab., Lemont, Ill.

HOT LABORATORIES AND EQUIPMENT. PAPERS PRESENTED AT ATOMIC ENERGY COMMISSION DIVISION OF REACTOR DEVELOPMENT INFORMATION MEETING MAY 16, 17, AND 18, 1951. 317p. Contract W-31-109-eng-38. $50.40(ph OTS); $11.80 (mf OTS).

Facilities and equipment for handling radioactive materials are described. Sources of information on materials and equipment are discussed. A catalog of isometric drawings annotated with pertinent information is described. (C.H.)

13018 GAT-T-518

Goodyear Atomic Corp., Portsmouth, Ohio.

AUTOMATIC SAMPLE TUBE CLEANER. N. H. Duffy and W. S. Stringham. July 25, 1958. 5p. Contract AT(33-2)-1. $1.80(ph OTS); $1.80(mf OTS).

An automatic sample tube cleaner was designed and fabricated. Quick-connecting devices for the tubes and solenoid-operated air valves for all services are employed. The solenoids are actuated by an electrical timing mechanism which schedules steam, cleaning agent, hot water, air, and vacuum into the tube rack. With this apparatus it is possible to clean 48 tubes in the same time as was required for 13 tubes on the manually operated system. This results in a saving of one-half man-day per day and a more uniform, controlled cleaning method. (auth)

13019 NAA-SR-2687

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

MODIFIED HOT-CAVE FACILITY FOR REPROCESSING EXPERIMENTS. S. Strausberg, W. J. Gardner, J. Guon, T. E. Luebben, and T. H. Mills. June 30, 1958. 81p. Contract AT-11-1-GEN-8. $2.25(OTS).

The system consists of two hot-caves, a transfer cave, and associated utilities. Cave 1 (west) is used primarily for kilogram-scale processing experiments involving chemical reactions of irradiated reactor fuels at temperatures up to 1800°C. Cave 2 (east) is used primarily for mechanical operations such as decanning, component disassembly, and inspection. The transfer unit is for sample handling, waste removal, intercave transfer, and the storage of kilocurie sources. (auth)

13020

DESIGN AND OPERATION OF A HIGH PRESSURE MERCURY POROSIMETER. O. G. Ingles (C.S.I.R.O., Melbourne). Australian J. Appl. Sci. 9, 120-6(1958) June.

Structural and operational problems of a mercury penetration porosimeter designed for pressures up to 50,000 psi are described. The total volume of pores with radii of the order of tens of Ångstroms and greater may be accurately determined. The instrument is fully hydraulic in operation. (auth)

13021

AN ELECTROSTATIC PRECIPITATOR FOR HIGH-SPEED SAMPLING. V. J. Lenger. Chem. listy 50, No. 1, 146-8(1956). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1345.)

An apparatus is described which permits the sampling of aerosols, gases, and vapors even at high flow rates (10 to 25 m/sec). The flow through the sampling inlet is maintained equal to that of the surrounding stream.

13022

MODERN TECHNIQUES USED IN THE PREPARATION AND SHIPMENT OF RADIOACTIVE Co-60 SOURCES. A. B. Lilli. pp. 563-78 in "Dozimetriya ioniziruyshchikh izlucheniy." Moscow, Gostekhteoretizdat, 1956. (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1322).

A detailed discussion is given of the design of capsules (C) for the irradiation of Co in the reactor, containers for the therapeutic sources (CT), and a hot cell (HC) rated at several thousand curies, for the preparation of the sources. A description is given of a container used in a shipment of the sources and of a device for the removal of C from the reactor. A C of length 4.5 cm and diameter 1.9 cm is prepared from high-purity Al. A reduction in the screening of the Co tablets from the neutron flux is achieved by the formation of an Al jacket inside the C. The CT consists of a thin (0.5 mm) stainless steel cup encased in a tungsten alloy block. Lead packings are inserted between the cup and the tungsten alloy lid. An HC of dimensions 84 × 65 × 56 cm is made of cast Pb 25-30 cm thick, jacketed in steel. A window of dimensions 25 × 16.5 cm is provided, consisting of 4 sheets of glass of density 6.2 gm/cm^3 with an over-all thickness of 10 cm and one plate of 5-cm thick cerium glass. A vacuum is maintained inside the HC. The extraction of the hot material from the HC is accomplished by means of a sliding Pb panel. The instruments and devices are mounted on steps. A brief description is given of the technique for using the HC. The rod with the C is withdrawn from the reactor into a first CT with Pb shielding (25 m), from which the C is transferred by means of sliding panels into a second CT. The second CT is used for shipment over greater distances.

13023

DESIGN OF NUCLEAR LABORATORIES. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 148, Session 19. Daniel I. Weinberg (ASTRA, Inc., Milford, Conn.). New York, American Institute of Chemical Engineers, 1958. 22p.

Nuclear physics laboratories require special care in their design to ensure adequate personnel protection and efficient use. Four types of nuclear equipment and the experimental programs associated with them were analyzed, and the facilities to accommodate them were developed, including performance of experiments and discussions with people who operate other facilities. The types of experiments and equipment considered were experimental reactors, reactor experiments, radioactive sources, and accelerators. (J.R.D.)

Radiation Chemistry

13024 AERE-C/R-2502

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE EFFECT OF PILE RADIATION ON THE REACTION BETWEEN HYDROGEN AND GRAPHITE. N. S. Corney and R. B. Thomas. June 1958. 35p. (RCTC/P-118).

The effect of pile radiation on the reaction between hydrogen and graphite was studied in an apparatus in BEPO. The apparatus used was an all glass circulating system, with the graphite specimen at a controlled temperature in the core of the pile. The reaction has been followed by analyzing samples of the gas for methane, this constituting 98% of the gaseous product. At the temperatures used, 500 and 600°C, steady rates of methane production were obtained up to 0.2% methane, there being no indication of an equilibrium state within this concentration range. The results can be accounted for qualitatively if it is assumed that the reaction proceeds through very short lived active intermediates which are formed by the action of pile radiation on hydrogen. As a comparative study the reaction was investigated under similar conditions but in the absence of pile radiation. An activation energy of 65 k. cal per gm. mole was obtained for methane production between 600 and 800°C. At lower temperatures the reaction is extremely slow and would appear to have a much lower activation energy. (auth)

13025 NP-tr-119

ON THE NATURE OF THE INSOLUBLE PRODUCT FORMED BY THE RADIOLYTIC OXIDATION OF BENZENE IN WATER. E. V. Barelko, L. I. Kartasheva, and M. A. Proskurnin. Translated by J. B. Sykes (U.K.A.E.A. Atomic Energy Research Establishment) from Doklady Akad. Nauk S.S.S.R. 116, 74-7(1957). 9p.

Experiments are presented on the conditions for the formation of, and nature of, the precipitate formed when benzene is radiolytically oxidized in the absence of oxygen. This subject is of both theoretical and practical interest, since the experiments have shown that the formation of a precipitate not only reduces the effective yield of phenol, but also hinders the separation of the latter, since the precipitate forms in the solution an almost insoluble and very stable suspension. (W.L.H.)

13026

THE POLYMERIZATION OF ISOBUTYLENE UNDER THE INFLUENCE OF BORON TRIFLUORIDE ADSORBED ON SILICA GEL. A. V. Topchiev and L. A. Alyavdina. Doklady Akad. Nauk S.S.S.R. 119, 720-3 (1958) Apr. 1. (In Russian)

Effects of volumetric rate, temperature, and working time of the catalyzer on the conversion of isobutylene and polymer fractional yield were studied. The data indicate that isobutylene polymerization is reduced with increased volumetric rate or with shorter contact with boron fluoride. It was also revealed that boron fluoride catalyzer on silica gel remains active for a long time and works effectively at 100°. The high isobutylene conversion shows an effective, continuous working of the catalyzer without regeneration for 158.3 hr. (R.V.J.)

13027

THE INITIATING EFFECT OF RADON EMISSION IN THE OXIDATION OF ISODECANE (2,7-DIMETHYLOCTANE). N. M. Emanuel, E. A. Blyumberg, D. M. Ziv, and V. L. Pikaeva (Radium Inst., Academy of Sciences, USSR). Doklady Akad. Nauk. S.S.S.R. 119, 1183-6(1958) Apr. 21. (In Russian)

Oxidation of isodecane(2,7-dimethyloctane) under the action of α particles of Ru was studied, considering the liquid state carbon oxidation as a degenerating branching chain reaction and that the stimulation of the processes is possible only in the initial stages. Experiments showed that even short periods of exposure to radon radiation considerably reduce the induction period of hydrogen peroxide formation and increases the maximum yield of peroxides. The Ru α radiation has even more pronounced affect on the rate of oxidation following the period of induction. (R.V.J.)

13028

CHEMICAL ACTION OF IONISING RADIATIONS IN SOLUTION. PART XXI. THE ACTION OF ^{60}Co γ-RADIATION ON AQUEOUS SOLUTIONS OF ETHYLENE AT DIFFERENT PRESSURES. P. G. Clay, G. R. A. Johnson, and J. Weiss (Oxford Univ.). J. Chem. Soc. 2175-91(1958) June.

Cobalt-60 irradiation of water saturated with ethylene (1 atm.), in the absence of oxygen, yields aldehydes, mainly acetaldehyde and n-butyraldehyde, and hydrogen peroxide, together with an oily polymer. From water, saturated with different ethylene-oxygen mixtures, the irradiation products are: acetaldehyde, formaldehyde, glycollaldehyde, hydrogen peroxide, and relatively small amounts of an organic hydroperoxide. Their formation at different ratios of [ethylene]/[oxygen], at different pH values, and in the presence of added ferrous salt has been studied. Irradiations of aqueous ethylene-oxygen solutions at higher pressures (up to 10 atm.) showed that the products and their yields, under these conditions, are not markedly different from those at lower pressures. (auth)

13029

REACTIONS OF THE ETHYL RADICAL. III. THE EFFECT OF DEUTERATION UPON THE METATHETICAL REACTION. D. G. L. James and E. W. R. Steacie (National Research Council, Ottawa, Can.). Proc. Roy. Soc. (London) A245, 470-80(1958) July 8.

The photolysis of 3-pentanone-d_{10} has been studied over a temperature range from 25 to 314°C, and the kinetic results agree closely with those observed with 2,2,4,4-(3-pentanone)-d_4. The reaction Et· + Me·CD_2·CO·CD_2·Me → Et·D + Me·CD·CO·CD_2·Me is common to both systems and no significant difference was found between the two possible values, either of the energy of activation or of the frequency factor. A value of 1.6 kcal/mole was found for the mean difference in activation energy for the abstraction of D or H, respectively, by the ethyl radical from the α-methylene group of 3-pentanone ($-d_{10}$, $-d_4$, or $-d_0$). This agrees well with the corresponding value of 1.6 kcal/mole for the abstraction of D or H by the methyl radical from acetone ($-d_6$ or $-d_0$). All five reactions share the same value of the frequency factor within the limits of experimental error. It is concluded that an appreciable isotopic effect is observed only when the substitution of D for H has increased the strength of the bond to be broken, and that this effect is an increase in the activation energy alone, the frequency factor remaining unaltered. (auth)

13030

MEASUREMENT OF HYDROGEN PEROXIDE FORMATION BY UV AND IONIZING RADIATION IN WATER SOLUTIONS. K. Damaschke (Bundesanstalt für Materialprüfung, Berlin-Dahlem). Z. Naturforsch. 13b, 322-6(1958) May. (In German)

The formation of H_2O_2 by UV and ionizing radiation under various experimental conditions was followed by means of the electrochemical determination of H_2O_2. The method of anode measurement permits 2×10^{-6} mole/l of H_2O_2 to be detected and recorded continuously. Zinc oxide was used for the absorption of the UV radiation. The quantity of H_2O_2 formed is directly proportional to the ZnO concentration. A linear dependence between the H_2O_2 produced and the irradiation time as well as the radiation intensity was found. With x radiation, the quantity of H_2O_2 formed at constant voltage is proportional to the irradiation dosage (max time). The formation rate of H_2O_2 up to 2000 μ g/l shows a linear dependence on the O_2 concentration. Co^{60} and Ir^{192}, used as gamma radiation sources, show a proportionality between the peroxide formed and the exposure time on the one hand and the radioactivity of the source used on the other. For the formation of H_2O_2 in water solutions, the secondary electrons formed or the photoelectrons are the determinant as they are in the radiation of solutions containing ZnO. An investigation was also made using Sr^{90} as a beta source and it showed that here also peroxide was formed in small quantities. (tr-auth)

Radiation Effects

13031 NYO-7499

Pennsylvania State Univ., University Park.

EFFECT OF RADIATION ON DYNAMIC PROPERTIES OF HIGH POLYMERS. Progress Report Covering Period July 1, 1957 to June 30, 1958. J. A. Sauer. July 1, 1958. 19p. Contract AT(30-1)-1858. $3.30 (ph OTS); $2.40(mf OTS).

Progress made during the last year is briefly summarized. Nine additional technical papers on various aspects of the research work have appeared in print during the last twelve months and these are listed by title and author. A number of additional polymers were investigated during the year by both dynamic mechanical techniques and nuclear magnetic resonance techniques. Studies on irradiated polyethylenes were made both for materials subject to Co^{60} radiation as well as to pile radiation. Apparatus for measuring specific volume from 150°K to above the melting point was completed, and a series of branched and irradiated polyethylenes was investigated. Progress has also been made in designing and constructing new apparatus for measurement of mechanical properties over a frequency range from $^1/_{100}$ c/s to 20 Mc/s. Dielectric apparatus was assembled and investigations begun, both experimental and theoretical, on determination of the detailed structure of polymer molecules. (auth)

13032

EFFECTS OF IONIZING RADIATIONS ON POLYETHYLENE. Kenichi Shinohara (Scientific Research Inst., Tokyo) and Ayao Amemiya and Akibumi Danno (Univ. of Tokyo). J. Phys. Soc. Japan 13, 604-8(1958) June.

Polyethylene films were irradiated in the air by deuterons accelerated by a cyclotron and by gamma rays from Co^{60} source. Gel fraction, swelling ratio, weight changes, and infrared absorption spectra of irradiated specimens were measured. It was found that the specimen irradiated by deuterons was cross-linked and became insoluble in xylene. The effects of deuteron irradiation seem almost the same as those of other ionizing radiations such as pile or gamma rays. Infrared absorption spectra reveals some difference in that the ratio of E_{co}/E_{cc} is 0.65 in the deuteron irradiation and is smaller than the value of 14.0 resulting from gamma ray irradiation, where E_{co} is the optical density of carbonyl groups and E_{cc} that of unsaturation. Some considerations are given on the possible explanation of this difference. (auth)

13033

EFFECTS OF IONIZING RADIATIONS ON POLYVINYL ALCOHOL. I. BREAKDOWN OF MAINCHAIN AND FORMATION OF CARBONYL GROUPS. Akibumi Danno (Univ. of Tokyo). J. Phys. Soc. Japan 13, 609-13(1958) June.

Polyvinyl alcohol in the form of film and powder were irradiated in air by gamma rays from a Co^{60} source, and by deuterons accelerated by a cyclotron. Weight changes, viscosity, solubility, and infrared absorption spectra of irradiated samples were measured as a function of absorbed dose. The reduction of the molecular weight of the irradiated specimens was observed suggesting that the effect was one of degradation. Infrared absorption spectra showed the formation of the carbonyl groups in the irradiated specimen. (auth)

13034

EFFECTS OF IONIZING RADIATION ON POLYVINYL ALCOHOL. II. CHANGES OF PHYSICAL PROPERTIES OF THE IRRADIATED SPECIMEN CAUSED BY HEAT TREATMENT. Akibumi Danno (Univ. of Tokyo). J. Phys. Soc. Japan 13, 614-17(1958) June.

The physical properties of polyvinyl alcohol irradiated by deuterons or gamma rays were found to change remarkably by heat treatment. Irradiation causes the decrease of the molecular weight and the increase of the carbonyl groups. When these specimens are heated above 120°C, however, the solubility diminishes considerably and even gel formation occurs for highly irradiated ones. Infrared absorption spectra revealed that the number of carbonyl groups formed by the irradiation decreased greatly as a result of heat treatment. Some discussion are given on the process of gel formation. (auth)

Rare Earths and Rare-earth Compounds

Refer to abstract 13604.

Separation Procedures

Refer also to abstract 13007.

13035 AECU-3780

Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.

RESIN ATTRITION. G. R. Seiler, P. R. Ammann, and A. B. Newey. Apr. 9, 1958. 28p. [For Oak Ridge Gaseous Diffusion Plant. Contract W-7405-eng-26, Subcontract No. 70]. (KT-335). $4.80(ph OTS); $2.70 (mf OTS).

Uranium metal is produced by the bomb reduction of UF_4 with Mg. The slag from this reduction contains appreciable quantities of U, either in the metallic or the tetrafluoride form, in addition to the MgF_2. A process for recovering low enrichment U from this slag has gone into operation. A study of the causes of resin attrition and their relative magnitude both from an over-all point of view and with specific reference to the Higgins' Column and Dowex 21K resin is presented. Equipment was designed, assembled, and tested to investigate the effects of valve action, wall to resin and resin to resin friction, repeated chemical cycling, and column height. Certain mechanical properties of the

resin beads were investigated, and some existing plant data were analyzed. A discussion of the probable mechanism of attrition and its contribution to the overall amount of attrition is presented. (W.L.H.)

13036 AERE-C/R-1199

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME EXPERIMENTS ON RATES OF TRANSFER OF NITRATES BETWEEN AN AQUEOUS AND A TRIBUTYL PHOSPHATE PHASE. H. A. C. McKay and D. Rees. June 1953. Decl. July 24, 1958. 9p.

The transfer of the nitrates of H, Y, Zr, Co, Th, U, Np, and especially Pu from a tributyl phosphate (TBP) phase to an aqueous phase has been studied by the single drop technique. Appreciable but not large trends with acidity and with TBP concentration have been found in the case of Pu. The rates tend to fall with increasing atomic number. (auth)

13037 AERE-M/M-194

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME EXPERIMENTS ON THE FUSED SALT PROCESSING OF LIQUID METAL FUELS. J. K. Higgins. June 1958. 9p.

The reaction between a fused sodium, potassium, magnesium chloride eutectic and a liquid bismuth solution containing small amounts of a rare earth cerium (~100 ppm by wt) and uranium (~1000 ppm by wt) is considered. Experimental results are given for the transfer of cerium and uranium from the metal to the salt phase in a silica container. It is concluded that contamination from this container presents serious difficulties to an electrolytic method for the processing of liquid metal fuels. (auth)

13038 ANL-5874

Argonne National Lab., Lemont, Ill.

THE EFFECT OF PULSATION ON LIQUID-LIQUID MASS-TRANSFER RESISTANCES. Manuel R. Eugenio. July 1958. 119p. Contract W-31-109-eng-38. $2.50 (OTS).

A study of individual mass-transfer resistances in liquid-liquid extraction and the effects on these of such variables as flow rate is presented. A partially miscible system was used in the determination of individual film mass-transfer resistances in a pulsed column and to investigate the effect of pulsed column variables, such as pulse frequency, pulse amplitude, and flow rates, on the individual resistances. (W.L.H.)

13039 BNL-482

Brookhaven National Lab., Upton, N. Y.

THE EXTRACTION OF PROTACTINIUM FROM SOLID THORIUM FLUORIDE. F. T. Miles, R. J. Heus, and R. H. Wiswall, Jr. Nov. 1954. 28p. $1.00(OTS).

The extraction of protactinium tracer from solid thorium fluoride by fluorine and other gases was investigated under a variety of conditions. The results are believed to have a bearing on gas-solid reactions in general. The rate was found to be strongly dependent on particle size and temperature. The slow step is probably diffusion through the solid. When the thorium fluoride is finely divided, the rate decreases markedly with time. This decline is caused by sintering. The sintering phenomenon was explored from another direction by following the decrease in surface area, as measured by nitrogen adsorption, of fine thorium fluoride powder exposed to high temperature. The correlation between extraction behavior and surface area is not quantitative. A hypothesis which accounts for the discrepancy is discussed in the text. A chemical cycle was developed by which the original properties of sintered thorium fluoride could be restored. (auth)

13040 DOW-98

Dow Chemical Co. Western Div., Pittsburg, Calif.

RECOVERY OF URANIUM FROM NORMAL AND TRIPLE SUPERPHOSPHATE WITH ORGANIC EXTRACTANTS. R. S. Long and J. Frank Walle-Riestra. June 15, 1953. Decl. Mar. 12, 1958. 69p. Contract AT-30-1-GEN-236. $12.30(ph OTS); $4.50 (mf OTS).

Laboratory development of a process for recovery of U from superphosphate by leaching with octyl pyrophosphoric acid is described. Data are given from studies of phase ratios, concentrations, extractants, diluents, and the effects of variables. Engineering evaluations of the process, equipment, materials, and costs are also reported. (T.R.H.)

13041 DP-293

Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.

REMOVAL OF SILICA FROM SOLUTIONS OF NUCLEAR FUELS. Harold J. Groh. June 1958. 12p. Contract AT(07-2)-1. $0.50(OTS).

By the addition of gelatin, small amounts of silica present in nitric acid solutions of metals can be flocculated for ready removal by filtration or centrifugation. In the processing of nuclear reactor fuels by solvent extraction, the prior removal of silica by gelatin reduces emulsification and solids accumulation without complicating product recovery, fission product removal, or waste disposal. (auth)

13042 HW-23141

[Hanford Works], Richland, Wash.

THE VALVE-ACTUATED PULSE COLUMN DESIGN AND OPERATION. L. L. Burger and L. H. Clark. Dec. 3, 1951. Decl. Feb. 13, 1958. 18p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A countercurrent extraction column is described which employs timed solenoid valves and pressurized feeds to provide a pulsing action to disperse the phases. The steps in the pulsing cycle are independent and thus provide greater separation of the operating variables than is possible with conventional pulse columns. The column described is particularly useful as a research tool for the study of extraction mechanism although a larger installation operating on the same principles should be quite workable. The 4-stage-cycle or mixer-settler type column operation has an inherent advantage in that the rapid coalescence and redispersion of phases are believed to lead to greater extraction than simple movement of a dispersed phase through a continuous medium. In addition, the sharp pulse provided should produce greater turbulence than the more conventional pulsing arrangement. Some results of operation on the extraction and stripping of uranyl nitrate using tributyl phosphate as a solvent are included. These data correspond to Metal Recovery and Purex type systems. (auth)

13043 ISC-867

Ames Lab., Ames, Iowa.

ISOTOPIC EQUILIBRIA OF NITROSYL CHLORIDE. Riley Schaeffer and Hampton Smith. June 4, 1957. 12p. Contract W-7405-eng-82. $0.50(OTS).

The electrolytic solvent characteristics of liquid nitrosyl chloride and general consideration of the factors affecting suitability of a system for isotope separation suggest that exchange reactions of NOCl might provide an interesting and useful means for the

separation of the stable isotopes of nitrogen or of chlorine, or of both in a simultaneous process. Vibrational frequencies of isotope substituted NOCl molecules are calculated and used to estimate equilibrium constants for exchange of nitrosyl chloride with nitric oxide and with chlorine. Provisional experimental values of the equilibrium constants are given. (auth)

13044 JENER-55
Joint Establishment for Nuclear Energy Research, Kjeller, Norway.
A 3-STAGED METHOD FOR THE RECOVERY OF PLUTONIUM FROM IRRADIATED FUELS. Rolf O. Lingjaerde. June 24, 1958. 11p.

A method is described for the recovery of Pu from spent fuel elements. The process involves 3 stages: 1) Extraction of U + Pu with TBP, 2) separation of Zr/Nb from the TBP phase on a silica gel column, and 3) separating Pu from U—still in the TBP phase—on a Dowex-50 column. The experimental procedure is given, and the mechanisms for the changes occurring on the silica gel and the Dowex-50 columns are discussed. The final Pu product is not completely free from U, and further purification is necessary. (auth)

13045 NLCO-719
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF BICROFT URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Feb. 26, 1958. 21p. Contract AT(30-1)-1156. $0.75(OTS).

The laboratory and pilot plant evaluation of Bicroft uranium concentrate is presented. Digestion and extraction tests indicate this concentrate should present no problems in the National Lead Company of Ohio Refinery process, using standard operating conditions. With the exception of thorium content, this concentrate meets all impurity tolerance specifications. The thorium specification can be met by the addition of phosphate as required for thorium-containing uranium concentrates. The fluoride content approaches the fluoride tolerance limit. Therefore, future receipts of this material warrant a close check of the level of this contaminant. (auth)

13046 NLCO-732
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF DENISON URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 2, 1958. 10p. Contract AT(30-1)-1156. $0.50(OTS).

The laboratory and Pilot Plant evaluation of Denison uranium concentrate is presented in this report. With the exception of thorium and chloride content, this material meets all FMPC impurity tolerance limits. The thorium tolerance limit can be met by the addition of phosphate as required for thorium-containing uranium concentrates. The chloride content can be lowered below the tolerance limit by blending this material with a high-quality concentrate. Digestion and extraction tests indicate that the concentrate should give acceptable performance when processed under the suggested conditions. That is, with the exception of a lower extraction column pulse frequency, the standard operating conditions should be used. A slightly reduced organic extract saturation may be necessary to prevent excessive uranium losses in the raffinate. (auth)

13047 NLCO-734
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF LORADO URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 22, 1958. 9p. Contract AT(30-1)-1156. $0.50(OTS).

The laboratory and pilot plant evaluation of Lorado uranium concentrate is presented. Chemical analyses reveal that it meets all existing FMPC impurity tolerance limits except that for chloride content. Blending with a high-quality concentrate will be necessary to lower the chloride level below the tolerance limit. Digestion and extraction tests indicate that this concentrate should cause no operational problems in the FMPC Refinery process if standard operating conditions are used with only slight variations (i.e., a lower pulse frequency and a greater pulse amplitude). (auth)

13048 NLCO-735
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF FARADAY URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 17, 1958. 10p. Contract AT(30-1)-1156. $0.50(OTS).

The laboratory and pilot plant evaluation of Faraday uranium concentrate is presented in this report. This concentrate meets all FMPC impurity tolerance limits except those for total organic and thorium. The thorium limit can be met by the addition of phosphate as required for thorium-containing uranium concentrates. The total organic content can be lowered below the limit for it by blending the material with a high-quality concentrate. Digestion and extraction tests indicate that this material should present no operational problems in the National Lead Company of Ohio Refinery process if the suggested operating conditions are used. That is, with the exception of a lower extraction column pulse frequency, the standard operating conditions should be used. (auth)

13049 NLCO-736
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF PRONTO URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 24, 1958. 10p. Contract AT(30-1)-1156. $0.50(OTS).

The laboratory and pilot plant evaluation of Pronto uranium concentrate is presented in this report. This concentrate meets all FMPC impurity tolerance limits except those for thorium and chloride. The thorium tolerance limit can be met by the addition of phosphate as required for thorium--containing uranium concentrates. Blending of this material with a high-quality, low-chloride-content uranium concentrate will be necessary to lower the chloride content below the tolerance limit. Digestion and extraction tests indicate that new receipts of Pronto concentrate can be processed in the FMPC Refinery using the suggested operating conditions. That is, with the exception of a lower extraction column pulse frequency and possibly a reduced organic product saturation to prevent excessive uranium losses in the raffinate, the standard operating conditions should be used. (auth)

13050 NLCO-738
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF NORTHSPAN URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 10, 1958. 11p. Contract AT(30-1)-1156. $0.50 OTS).

The laboratory and pilot plant evaluation of Northspan uranium concentrate is presented. Chemical analyses reveal that it meets all existing impurity tolerance limits, except that for thorium. The thorium tolerance limit can be met by the addition of phosphate, as is required for thorium containing concentrates. Digestion

and extraction tests indicate that this concentrate should present no problems in the refinery process if standard operating conditions are used. (auth)

13051 NLCO-739
National Lead Co. of Ohio, Cincinnati.
LABORATORY EVALUATION OF LAKESIDE MONARCH URANIUM ORE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 14, 1958. 8p. Contract AT(30-1)-1156. $0.50(OTS).

The chemical analyses of Lakeside Monarch uranium ore show that this material does not meet several of the FMPC impurity tolerance limits. Digestion studies show that the ore cannot be digested successfully and that the very large quantity of nitric acid insolubles in this ore would prevent the processing of this material without blending in the Refinery. It is possible that the ore could be processed if blended with a high quality material. It is recommended that ores of this type be processed to concentrates for shipment to the refineries. (auth)

13052 NLCO-740
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF CAN-MET URANIUM CONCENTRATE. Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Apr. 14, 1958. 10p. Contract AT(30-1)-1156. $0.50 (OTS).

The laboratory and pilot plant evaluation of Can-Met uranium concentrate is presented. With the exception of thorium content, Can-Met concentrate meets all FMPC impurity tolerance limits. The thorium tolerance limit can be met by the addition of phosphate, as is required for thorium-containing concentrates. Digestion and extraction tests indicate no problems in the FMPC Refinery if suggested operating conditions are used (that is, standard operating conditions with the exception of a lower pulse frequency). (auth)

13053 NLCO-744
National Lead Co. of Ohio, Cincinnati.
TBP-KEROSENE SOLVENT DEGRADATION: LITERATURE SEARCH. Robert H. Ellerhorst and Robert K. Klopfenstein. Feb. 11, 1958. 23p. Contract AT(30-1)-1156. $1.00(OTS).

A search of the classified and unclassified literature concerning the degradation of a tributyl phosphate (TBP)-kerosene solvent has been conducted. Chemical Abstracts, Nuclear Science Abstracts, Abstracts of Classified Reports, and the card file of the National Lead Company of Ohio's Library were included in the search. Pertinent information is presented, in abstract form, as it applies to extractant (TBP) degradation, diluent (kerosene) degradation, and solvent clean-up techniques. (auth)

13054 NYO-208(Suppl.)
Girdler Corp. Gas Processes Div., Louisville, Ky.
ADDITIONAL ENGINEERING STUDIES (PRELIMINARY) —POLYMER PROJECT. (PRODUCTION FACILITIES FOR BORON 10). Apr. 17, 1953. Decl. Apr. 25, 1958. 19p. Contract AT(30-1)-1506. $4.80(ph OTS); $2.70 (mf OTS).

A study made on the design and cost of a plant for the production of pulverized crystalline B^{10} isotope is presented. (W.L.H.)

13055 NYO-210
Girdler Corp. Gas Processes Div., Louisville, Ky.
ADDITIONAL ENGINEERING STUDIES—POLYMER PROJECT. (PRODUCTION FACILITIES FOR BORON 10). Apr. 24, 1953. Decl. Apr. 25, 1958. 24p. Contract AT(30-1)-1506. $4.80(ph OTS); $2.70(mf OTS).

A supplement to NYO-208.

A study made on the design and cost of a plant for the production of pulverized crystalline B^{10} isotope is presented. (W.L.H.)

13056 WIN-104
National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.
SOME EXPERIMENTS WITH AERATION AND AGITATION OF CARBONATE LEACHING SLURRIES. Robert A. Eisenhauer and Galen W. Clevenger. June 23, 1958. 31p. Contract AT(49-6)-924. $4.80(ph OTS); $2.70(mf OTS).

Data are presented on the effect of various amounts and methods of aeration on uranium leaching extraction and power requirements of mechanical agitators. The effect of tank depth on air oxidation is considered. (auth)

13057 AEC-tr-3312
INTERRELATIONSHIP OF STRUCTURE AND EXCHANGE CAPACITY OF CATIONIC RESINS. G. J. Moralli. Translated by K. S. Bevis for Savannah River Lab. from J. recherches centre natl. recherche sci., Lab. Bellevue (Paris), No. 26, 277-89(1954). 24p.

Starting with ion exchange resins prepared from specific monomers, it is possible to study the ion exchange phenomenon by both a dynamic and a static method. Sulfonated phenol resins, having the sulfonic groups in the ortho position with respect to the phenolic hydroxyl group, have a higher capacity than the others, and one that is higher than the theoretical content of sulfonic groups. This fact proves that, in this case, there is an activation of the phenolic hydroxyl groups which also take part in the exchange. Some measurements of exchange selectivity, made on a mixture of radiosodium and radiopotassium, demonstrated that there is a great deal of interest in using resins of a known structure, preferably commercial resins. (auth)

13058
LABORATORY CHEMICAL COAGULATION STUDIES ON THE REMOVAL OF FALLOUT RADIOACTIVITY IN WATERS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 142, Session 35. Lloyd R. Setter and Helen H. Russell (Robert A. Taft Sanitary Engineering Center, Cincinnati). New York, American Institute of Chemical Engineers, 1958. 21p.

A summary of the laboratory jar tests on chemical coagulation for the removal of radioactive materials found in Cincinnati rain, cistern water, surface water, and rain leachings through native soils is presented, including results of coagulating carbonated and non-carbonated distilled water extracts of an alkaline soil contaminated with bomb debris. The coagulation was done with alum, hydrated lime, and various coagulant aids, and results indicate that all suspended beta and some of the soluble beta activity are removed. (J.R.D.)

13059
SEPARATION OF TECHNETIUM FROM RHENIUM BY ELECTROPHORESIS AND PAPER CHROMATOGRAPHY. Rodrigo Alberto Guedes de Carvalho. Thesis, Universidade do Porto, Portugal, 1958. (In Portuguese)

The known facts on the physical and chemical properties of technetium are reviewed, including the separation of technetium from other elements and its determination. The theoretical considerations of paper electrophoresis and chromatography are discussed. The experimental procedures are described in detail, and the results are given. A special study was made of the reduction and complex formation of rhenium. 66 references.

Sorption Phenomena

13060

ZIRCONIUM AND BARIUM ADSORPTION ON TUNGSTEN AND ELECTRON YIELD. V. N. Shrednik (Leningrad Inst. of Physics and Tech.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 594-604(1958) May. (In Russian)

The behavior of Zr layers on W monocrystals was studied to determine the changes in emission properties of Zr concentration. Comparisons were made with the behavior of barium on W crystals. (R.V.J.)

13061

THE HEATS OF ATOMIC AND MOLECULAR CHEMISORPTION OF HYDROGEN ON NICKEL, IRON, CHROMIUM, AND PLATINUM. N. N. Kavtaradze (Inst. of Physical Chemistry, Moscow). Zhur. Fiz. Khim. 32, 1055-8(1958) May. (In Russian)

The reduced molecular chemisorption isotherms were studied on the basis of the equilibrium hydrogen chemisorption mechanism, and the differential heats of chemisorption were calculated for Ni, Fe, Cr and Pt. A correlation was established between the heats of atomic chemisorption and the coverage. The calculated values for the heats of atomic chemisorption of hydrogen are in accord with the measurements of Beeck and collaborators. A change in the heats of hydrogen adsorption on nickel and other metals when passing from atomic to molecular adsorption was observed, and an explanation of this phenomenon was proposed. (tr-auth)

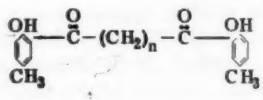
Syntheses

13062 WADC-TR-56-203(Pt. III)

Pennsylvania State Univ., University Park. Coll. of Chemistry and Physics.

COORDINATION POLYMERS. [Period covered] March 1, 1957 to February 28, 1958. W. Conard Fernelius, Maurice Shamma, L. A. Davis, D. E. Goldberg, B. B. Martin, D. F. Martin, and F. D. Thomas, II. Mar. 1958. 87p. Project title: RUBBER, PLASTICS AND COMPOSITE MATERIALS. Task title: SYNTHESIS AND EVALUATION OF NEW POLYMERS. Contract AF33(616)-2742. (AD-155525).

As part of a study of the influence of structural variation on the properties of bis(β-diketones) and their metal derivatives, compounds of the following types have been prepared: (1) $RCOCH_2CO$-Y-$COCH_2COR$, (2) $[(R'CO)(RCO)$-$CH_2CHR'']$ and (3) $(RCO)(R'CO)$CH-Y-$CH(COR')(COR)$. The methods of synthesis of these compounds have been studied. Compounds of types (2) and (3) offer the best promise of obtaining wide structural variation. Efforts to obtain bis(β-diketones) containing fluorine atoms have failed, although some of the methods used have been successful when applied to other systems. The infrared and ultraviolet absorption spectra of various bis(β-diketones) have been obtained. Various modifications of the polymerization techniques are being studied in an attempt to obtain high-molecular-weight polymers from the bis(β-diketones). Methods for fractionally separating polymers in order to get some idea of size distribution promise to be successful with the bis(β-diketone)-metal polymers. The Fries rearrangement of di-p-tolyl esters has been studied as a means of preparing bis(o-hydroxyketones). As a result, di-p-tolyl esters have been prepared from succinic acid through and including sebacic acid, diglycolic acid, and phthalic, isophthalic and terephthalic acids. The esters from succinic acid through and including sebacic acid were successfully rearranged (Fries rearrangement) to their corresponding bis(o-hydroxyketone):



where n equals 2 to 8. The rearrangement was unsuccessful for di-p-tolyldiglycolate. The rearrangement of the di-p-tolyl esters of isophthalic and terephthalic acids led to the formation of their corresponding bis(o-hydroxyketones). Attempted rearrangement of di-p-tolyl phthalate resulted in the formation of 1-hydroxy-5-methylanthraquinone. The infrared absorption spectra of the various bis(o-hydroxyketones) have been obtained. In an attempt to prepare 5-acyl compounds of 8-hydroxyquinoline by the Fries rearrangement of 8-hydroxyquinoline esters, the following esters were prepared: 8-hydroxyquinolylacetate, propanoate, butanoate, benzoate, and adipate. The Fries rearrangement of the 8-hydroxyquinoline esters was unsuccessful. (auth)

13063

THE POLYMERIZATION OF ISOBUTYLENE UNDER THE INFLUENCE OF BORON TRIFLUORIDE ADSORBED ON ALUMINIUM OXIDE. A. V. Topchiev and L. A. Alyavdina. Doklady Akad. Nauk 119, 957-60(1958) Apr. 11. (In Russian)

The effects of temperature, volume rate, carrier, and operation time of the catalyzer are investigated. (R.V.J.)

13064

NEW MAGNETIC COMPOUNDS OF THE ILMENITE-TYPE STRUCTURE. T. J. Swoboda, R. C. Toole, and J. D. Vaughan (E. I. du Pont de Nemours and Co., Wilmington, Del.). Phys. and Chem. Solids 5, 293-8 (1958).

Two new ferromagnetic oxides, $CoMnO_3$ and $NiMnO_3$, were synthesized by reacting the appropriate binary oxides under hydrothermal conditions. These compounds have rhombohedral, ilmenite-type crystal structures, i.e. they are isomorphous with $FeTiO_3$ and are believed to be the first oxides with this structure reported to be ferromagnetic. The specific moment of each oxide is of the order of 14 cgs units/g at room temperature. Intrinsic coercive forces as high as 9000 oersteds for $CoMnO_3$ and 1240 oersteds for $NiMnO_3$ were observed for samples of these oxides that were severely cold worked. The magnetic properties of $CoMnO_3$ and $NiMnO_3$ indicate that they possess high magnetocrystalline anisotropies and that their direction of easy magnetization does not lie along the principal crystallographic symmetry axis but lies probably in the basal plane. (auth)

Transuranic Elements and Compounds

13065

DISCOVERY OF THE ELEMENT 102. S. S. Rodin. Nauka i Zhizn No. 12, 47(1957). (In Russian)

In July, 1957, the discovery of element 102 was announced by a group of Swedish scientists. The new element was obtained by bringing particles of curium (element 96) into contact with carbon ions, accelerated in a cyclotron. The new element has the mass 253 and is extremely unstable. Its half-life is from 10 to 12 minutes, emitting alpha particles with an energy of 8.5 Mev. (TCO)

Uranium and Uranium Compounds

13066 AECU-3599

Wisconsin. Univ., Madison.

URANIUM RECOVERY, URANIUM GEOCHEMISTRY, THERMOLUMINESCENCE AND RELATED STUDIES. Final Report. Farrington Daniels. Nov. 1957. 58p. Contract AT(11-1)-178. $1.75(OTS).

The recovery of uranium at the mine with portable equipment was shown to be feasible, using a process which involves grinding the ore, leaching with nitric acid, extracting with tributyl phosphate and kerosene, and precipitation with ammonia gas. The system is more expensive than a stationary plant but could be used in an emergency or in difficultly accessible locations. The distribution of uranium was studied in various geographical locations and in several different materials including limestones, granites, clays, rivers and underground water, lignites, and volcanic ash and lavas. Geochemical studies, based on thermoluminescence, including stratigraphy, age determinations of limestones, and aragonite-calcite relations in calcium carbonate are presented along with thermoluminescence studies of lithium fluoride, alkali halides, aluminum oxides, sulfates, and other inorganic salts and minerals. Radiation damage to lithium fluoride and metamixed minerals was studied, and apparatus was developed for measuring thermoluminescence of crystals exposed to gamma radiation, scintillameters for measuring alpha particle activity in materials containing a trace of uranium, and an analytical method for determining less than 1 part per million uranium. (J.R.D.)

13067 AERE-C/M-229

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE SOLUBILITY OF URANYL COMPOUNDS IN ALKALI NITRATE–NITRITE MELTS. J. R. Findlay and J. N. Gregory. Nov. 29, 1954. Decl. July 24, 1958. 4p. (RCTC-38).

The solubilities of uranyl nitrate hexahydrate and anhydrous uranyl sulfate were measured in $NaNO_3$/$NaNO_2$ and $NaNO_2$/KNO_3 eutectic mixtures at temperatures ranging from 200 to 330°C. It seems that, even at the lowest temperature, both compounds decompose to UO_3 (or a sodium uranate) the solubility of which is negligible (probably less than 0.02% U). (auth)

13068 AERE-M/R-632

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

DIFFERENTIAL THERMAL ANALYSIS OF THE URANIUM OXIDES. P. Murray and R. W. Thackray. Jan. 1951. Decl. July 24, 1958. 15p.

Characteristic exothermic peaks related to the chemical and phase changes occurring on oxidation of UO_2 are obtained by differential thermal analysis. From these curves, quantitative estimation of UO_2 in oxide mixtures is possible. The shapes of the peaks confirm the conclusions of Anderson and Alberman that the initial oxidation from UO_2 to $UO_{2.3}$ is diffusion-controlled, whereas nucleation via the breakdown of $UO_{2.3}$ into UO_2 and U_3O_8 is the rate determining step in the main oxidation to U_3O_8. It is suggested that the large volume change arising from the breakdown of $UO_{2.3}$ results in the disruption of the matrix and the exposure of fresh surfaces, thus allowing wing rapid oxidation of the UO_2 to U_3O_8. It is found that non-stoichiometric oxides in the range UO_2–U_3O_8 are more susceptible to oxidation than Mallinckrodt UO_2. This is attributed to the presence of spatial imperfections or lattice defects arising from the interstitial incorporation into the lattice of oxygen atoms in excess of the stoichiometric composition UO_2. (auth)

13069 AERE-M/R-1049

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE PRODUCTION OF URANIUM POWDER BY THE URANIUM DIOXIDE–MAGNESIUM ROUTE. R. G. Bellamy and J. H. Buddery. Oct. 28, 1952. Decl. July 24, 1958. 32p.

The uranium dioxide–magnesium route has been investigated as a method of obtaining uranium metal. Conditions have been determined for the production of non-pyrophoric, substantially oxide-free powder of acceptable particle shape and size by heating uranium dioxide with magnesium and a flux (preferably magnesium chloride) in a line-lined, heat resisting steel vessel out of contact with air; crushing the resulting reaction cake; and leaching with either nitric or acetic acids. Conditions for washing, drying, and if necessary waxing the powder for subsequent fabrication stages are described. (auth)

13070 NLCO-743

National Lead Co. of Ohio, Cincinnati.

THE PREPARATION OF URANIUM HEXAFLUORIDE FROM URANIUM ORES AND CONCENTRATES BY FLUORIDE VOLATILITY PROCESSES—AN ANNOTATED BIBLIOGRAPHY. Earl W. Mautz and Charles J. Fetner. Feb. 26, 1958. 16p. Contract AT(30-1)-1156. $0.75(OTS).

An annotated bibliography of publications relating to the preparation of uranium hexafluoride from uranium ores and concentrates by fluoride volatility processes is presented. (auth)

13071

PROBLEMS OF CHEMISTS IN THE PRODUCTION OF URANIUM AND THORIUM. G. Wirths (Deutsche Gold- und Silber-Scheideanstalt, Wolfgang bei Hanau). Acta Phys. Austriaca 11, 471-84(1958). (In German)

After an introductory discussion of the purity requirement, the technical procedures for the production of metallic reactor grade uranium and thorium are explained and discussed. (tr-auth)

13072

SINTERING AND HOT PRESSING OF URANIUM TETRAFLUORIDE. E. Barnes and P. Murray (Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Am. Soc. 41, 246-8(1958) July.

The basic sintering and hot-pressing conditions have been established for UF_4. Either sintering of cold compacted material in argon or direct hot pressing in graphite dies can be used satisfactorily to obtain high-bulk-density compacts. Vacuum sintering is ruled out because of the volatility of the UF_4. The occurrence of black localized areas in both sintered and hot-pressed material is attributed to the internal distortion of fluorine atoms into lattice voids resulting in the formation of strained areas. (auth)

13073

NOTE ON CORRELATION OF SURFACE CHARACTERISTICS OF URANIUM DIOXIDE POWDERS WITH THEIR SINTERING BEHAVIOR. D. R. Stenquist, B. Mastel, and R. J. Anicetti (General Electric Co., Richland, Wash.). J. Am. Ceram. Soc. 41, 273-4(1958) July.

The surface characteristics of Mallinckrodt PWR-grade and ceramic-grade UO_2 powders and Hanford-depleted UO_2 powder were investigated. The UO_2 pow-

ders were compacted at 15 tons/in^2. into pellets 0.600 in. in diameter and about 1 in. in height and then sintered for 8 hr at 1750°C. The percent change in density was used as a measure of sinterability. (W.D.M.)

Waste Disposal

13074 WIN-99

National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.

CHEMICAL STREAM POLLUTION FROM URANIUM MILLS. A. Whitman and E. S. Porter. June 13, 1958. 43p. Contract AT(49-6)-924. $7.80(ph OTS); $3.30 (mf OTS).

A study of chemical pollution of water supplies by tailings discharge from domestic uranium mills is presented. State water specifications are surveyed, the extent and nature of pollution are evaluated, and remedies are suggested. (auth)

13075

DISPOSAL OF RADIOACTIVE WASTE ON LAND. H. H. Hess and W. R. Thurston (Princeton Univ., N. J. and National Academy of Sciences, Washington). Trans. Am. Geophys. Union 39, 467-8(1958) June.

Two years' consideration of the disposal problem by the National Research Council Committee on Waste Disposal has led to certain conclusions which are presented. Waste may be safely disposed of at many sites in the United States but conversely there are many large areas in which it is unlikely that disposal sites can be found as, for example, the Atlantic seaboard. The research to ascertain feasibility of disposal has for the most part not yet been done. The most practical immediate solution of the problem suggests disposal in cavities mined in salt beds or domes. Disposal could be greatly simplified if the waste could be gotten into solid form of relatively insoluble character. Disposal in porous beds underground has capabilities of taking large volumes but will require considerable research to make the waste compatible with such an environment. The main difficulty with this method at present is to prevent clogging of pore space as waste is pumped in. (auth)

13076

ADSORPTION OF RADIOACTIVE WASTES BY SAVANNAH RIVER PLANT SOIL. W. E. Prout (E. I. du Pont de Nemours and Co.). Soil Sci. 86, 13-17 (1958) July.

The adsorption of radioisotopes on soil was investigated in the laboratory to determine the behavior of low-level radioactive waste solutions discharged to the ground. Strontium, cesium, and plutonium distributions between soil and waste solution were studied. The effects of cation concentration and acidity were determined. The results of the distribution experiments, and material balance considerations, permit prediction of the behavior of activity in beds of soil. Laboratory tests with beds of soil gave results that agreed with these predictions. These results can be applied to the disposal of radioactive solutions to the ground. A typical application is discussed. (auth)

13077

DISPOSAL OF RADIOACTIVE WASTES. II. Thomas Jaeger. Atomkern-Energie 3, 273-7(1958) July. (In German)

In this second part on disposal of radioactive wastes, the methods for disposal in use at the Idaho Chemical Processing Plant, Hanford, Oak Ridge, Harwell, and Windscale are reviewed. 17 references. (J.S.R.)

ENGINEERING

13078 AD-135086

Parsons Corp., Traverse City, Mich. and Battelle Memorial Inst., Columbus, Ohio.

A SYSTEM FOR AUTOMATIC PROCESSING OF FATIGUE DATA. [Period Covered] January 1, 1956 to March 31, 1957. A. J. Belfour and W. S. Hyler. Mar. 1957. 194p. Contracts AF33(616)-3300 and AF33(616)-3301.

This report presents and discusses a system for coding fatigue information on IBM cards for subsequent automatic processing of the data. Certain codes are needed for some types of entries; the design and preliminary development of these codes are included. The card system devised will permit coding not only the basic fatigue information (stress and lifetime) but also pertinent information describing: (1) the basic material and fabrication, (2) mechanical properties of the material, (3) specimen design and methods of preparation, and (4) type of test and associated testing procedure. The system is useful in coding information from basic fatigue studies of materials as well as component and structural fatigue studies. (auth)

13079 HW-46701(Del.)

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

BIBLIOGRAPHY AND ABSTRACTION OF DEENTRAINMENT LITERATURE. R. H. Bond and J. H. Murray. Nov. 13, 1956. Decl. with deletions June 3, 1958. 49p. Contract W-31-109-Eng-52. $7.80(ph OTS); $3.30 (mf OTS).

An abstract bibliography on deentrainment consisting of 81 references to periodical and research report literature is presented. It was prepared for Hanford personnel engaged in work requiring solution of deentrainment problems. (T.R.H.)

13080 HW-50580

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

IMPROVEMENT OF CANNING EQUIPMENT CYCLE TIMING SYSTEM, 313 BUILDING CANNING AREA. D. C. Lehfeldt. June 3, 1957. 19p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

During the past three years, considerable cost has been incurred operating and maintaining the present pneumatic cycle timing systems. For example, about 95% of the wearing parts have to be machined on the Hanford site as needed. Also, the pneumatic timer has not been reliable in repetitive cycle timing. A new cycle timing system has been designed and installed on canning line #1. It has functioned nine months continuously without any operating difficulties. This new cycle timing system has greater flexibility and more reliability. It has been composed of vendor-made components so that replacement parts can be obtained through purchasing channels. Design specifications and a preliminary design have been prepared for the key equipment and installations which have given the system its superior performance. (auth)

13081 MSAR-TR-321-12

MSA Research Corp., Callery, Penna.

TEST RESULTS OF LIQUID METAL CLOSED CYCLE COOLANT SYSTEM. Supplementary Report No. 1. R. C. Andrews and J. R. Betz. Nov. 15, 1957. 23p. (D-143-941-035). For Bell Aircraft Corp.

The test loop consisted of two systems: a NaK loop in which NaK was heated in a gas-fired furnace and pumped through a coil-in-shell evaporator in which the

NaK (tube side) transferred its heat to a boiling pool of sodium (shell side). The resultant sodium vapors passed through a sonic flow nozzle, through a radiant condenser, and into a measuring tank. Both systems were complete loops in which electromagnetic pumps supplied the necessary pumping force. Following completion of the test program the NaK system was washed and dismantled and inspected for evidence of corrosion or erosion. (W.L.H.)

13082 NYO-2322

Southwest Research Inst., San Antonio.

RESEARCH ON PROPERTIES OF MATERIALS EMPLOYED IN PRESSURE EQUIPMENT. Progress Report No. 1 [for] May 1 to July 1, 1958. L. U. Rastrelli and M. M. Lemcoe. July 10, 1958. 18p. Project No. 774-2. Contract AT(30-1)-2146. $3.30(ph OTS); $2.40(mf OTS).

The over-all objective of the program is to investigate pressure vessel design procedures and through a materials literature survey, determine those areas where information is significantly lacking. The resin of cumulative damage resulting from loads under temperature dependent and independent conditions is further subdivided into more specific areas of concern. Miner's Hypothesis for cumulative damage is discussed in some detail. Indications are that it is quite limited in application. On the other hand, there is reason to believe that the hypothesis can be useful within these well-defined limitations. (auth)

13083 TID-4100(1st Rev. and Suppl. 1)

Technical Information Service Extension, AEC.

ENGINEERING MATERIALS LIST. A Catalog of Drawings, Photographs, and Specifications Released by the United States Atomic Energy Commission. May 1958. 440p. Supplement 1: SHIPPINGPORT PRESSURIZED WATER REACTOR. July 1958. 55p.

Available from TISE —free.

Unclassified Engineering Materials List, TID-4100(1st Rev.), is a catalog of available U. S. Atomic Energy Commission unclassified engineering drawing materials on the peaceful applications of atomic energy. The engineering literature described in this publication includes drawing, specifications, photographs, bill of materials, cost analysis, design criteria, parts lists, and supporting textual data. This consolidated list includes all materials originally announced in TID-4100, January 1957, and TID-4100, Supplement 1, July 1957, and additional engineering data received and cataloged by TISE after the original issuances. The entire publication, TID-4100 1st Revision Supplement 1, is devoted to the Shippingport Pressurized Water Reactor. (W.L.H.)

13084

RELATIONSHIPS BETWEEN THE UNIVERSITIES AND INDUSTRY IN NUCLEAR ENGINEERING. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 164, Session 27 Glenn Murphy (Iowa State Coll., Ames). New York, American Institute of Chemical Engineers, 1958. 11p.

Universities can help industry by supplying potential employees well grounded in fundamentals, and by supplying new information resulting from research. Industry can help make it possible for the university to do these things by an interchange of new developments within the industry, by sponsoring research, and by helping the schools to obtain equipment or other capital items. It is also pointed out that the functions of industry, the government laboratories, and educational institutions are not competitive, but complimentary. (J.R.D.)

13085

RELATION BETWEEN INDUSTRY AND GOVERNMENT. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 165, Session 27. W. Kenneth Davis (Atomic Energy Commission, Washington). New York, American Institute of Chemical Engineers, 1958. 16p.

A review is presented of recent scientific development and its relationship to national scientific competency. Particular emphasis is given to the interests of young people and recent graduates. The undesirable peak-valley demand for scientists is discussed, and it is pointed out that those who choose careers in science and engineering must be assured rewards of a challenging career, adequate compensation, and reasonable security. A general view of industrial training programs in the atomic field is presented, and an outline of AEC efforts including ORSORT, and ISNS and E, the training in AEC contract facilities, and college assistance grants are discussed. A final discussion is presented, based on AEC experience, of how industry can aid in furthering the education and training in nuclear science and engineering. (J.R.D.)

13086

NUCLEAR TRAINING PROGRAMS FOR INDUSTRY PERSONNEL. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 166, Session 27. Saul J. Harris (Atomic Industrial Forum, Inc., New York). New York, American Institute of Chemical Engineers, 1958. 12p.

A review of current efforts being made by several companies is presented along with a discussion of the modifications which may have to be made as the nature of privately supported atom work changes. At the present most individuals are working in mechanical engineering since more effort is going into the design and engineering of reactor systems which require a background in materials and mechanical systems. The major sources of trained personnel at present are AEC installations and in recent years the traditional education systems. In most cases it is necessary to broaden the scope of an individual entering industry owned facilities because of the shift from development to production items. In looking to future long-range needs, industry proposes to meet their requirements by integrating nuclear technology into existing college and graduate curricula, stimulating primary and secondary school programs in mathematics and basic sciences, and by providing on-the-job training and financial support for additional college training during employment. (J.R.D.)

Heat Transfer and Fluid Flow

13087 GAT-236

Goodyear Atomic Corp., Portsmouth, Ohio.

HEAT TRANSFER AND PRESSURE DROP IN A VERTICAL SQUARE TUBE. H. L. Foltz. July 14, 1958. 14p. Contract AT-(33-2)-1. $0.50(OTS).

A ¼-inch square vertical copper tube inside an 8-foot-long shell was found to transfer heat in much the same manner as a round tube of equal hydraulic diameter. The pressure drop from the bottom to the top of the tube was measured for each operation. Heat flux was uniform throughout the length of the tube up to a steam-to-Freon temperature difference of 20°F. The range investigated was approximately from 10° to 20°F. Data obtained from a single run above 20°F, indicating that heat flux is not uniform above 20°F, are in agreement with the results of previous studies. (auth)

13088 HW-48460(Del.)
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
HEAT TRANSFER ASPECTS OF THE PRPR PLUTONIUM–ALUMINUM FUEL ELEMENTS. W. S. Figg. Feb. 13, 1957. Decl. with deletions Sept. 16, 1957. 11p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The heat transfer characteristics of the proposed 19-rod clusters of Zircaloy-3 jacketed Pu–Al fuel elements as well as clusters of UO_2 elements for the PRPR are presented. (W.L.H.)

13089 NACA-TN-4206
Langley Aeronautical Lab., Langley Field, Va.
MEASUREMENTS OF TOTAL HEMISPHERICAL EMISSIVITY OF VARIOUS OXIDIZED METALS AT HIGH TEMPERATURE. William R. Wade. Mar. 1958. 44p.

The results of measurements of total hemispherical emissivity over the temperature range of 600° to 2,000°F for various heavily oxidized metals are presented, together with a description of the equipment and the procedures used. The variation of total emissivity due to oxidation of the materials is presented, up to the highest temperature which produces an adherent oxide coating. Results from investigations to determine any deviation of the thermal radiation from Lambert's cosine law for the oxidized metals are presented. (auth)

13090 NGTER-143
Gt. Brit. National Gas Turbine Establishment, Farnborough, Hants, England.
THE COMPONENT PRESSURE LOSSES IN COMBUSTION CHAMBERS. H. A. Knight and R. B. Walker. Nov. 1953. Decl. June 20, 1958. 60p.

The available knowledge of the component losses in a combustion chamber is summarized. The information should enable the pressure drops through swirlers, primary baffles, and cooling systems to be calculated. Most of the data were abstracted and collected from the various reports listed in the bibliography. In certain cases (e.g., mixing losses) the information is incomplete and in these circumstances the limited experimental results available are supplemented by hypotheses which require proof. A specimen calculation of the pressure drop and air flow distribution of a typical chamber is given. The calculated and measured values of pressure drop (cold) agreed within 4%. (auth)

13091 TID-10087
Division of Reactor Development, AEC.
REACTOR INFORMATION MEETING AT ARGONNE NATIONAL LABORATORY, OCTOBER 7, 8, AND 9, 1953. PAPERS, PART V. HEAT TRANSFER. Decl. Mar. 18, 1957. 94p. $15.30(ph OTS); $5.40(mf OTS).

Papers are presented on: "Heat Transfer in Liquid-Metal-Fuel Reactors," "Conditions for Maximum Electric Output from Liquid Metal Cooled Reactors," "An Electrical Geometrical Analogue for Two-Directional Steady State Heat Conduction with Uniform Internal Heat Generation," "Two-Phase Pressure Drop," "Transient Density Response of Volume-Heated Liquid Systems," and "Relationship Between Void Volume and Power Density under Atmospheric Boiling." (M.H.R.)

13092 UCRL-5305
Broadview Research and Development, Burlingame, Calif.
AN INVESTIGATION OF TEMPERATURE MEASURING TECHNIQUES FOR USE IN HIGH POWER DENSITY NUCLEAR REACTORS. Boris Regent and Aryeh H. Samuel. [1957]. 101p. For University of California Radiation Lab. (BRD-57-2C1). $16.80(ph OTS); $5.70(mf OTS).

Temperature measuring techniques for application to temperatures up to 2000°C have been investigated. Emphasis has been placed on those methods suitable for use in the environment of a high power density nuclear reactor of particular design. A survey of available techniques is made and evaluated in the light of the general problem. The properties and behavior of materials at high temperatures and in a high flux of particle radiation are discussed. As a result of the preceding considerations and a comprehensive literature search thermoelectric thermometry emerges as the most favorable method. A discussion of thermoelectric thermometry is given and recommendations as to materials and construction of a proposed expedient thermocouple are given. An experimental program leading to a more satisfactory thermocouple assembly is discussed. (auth)

13093 SCL-T-9
EXACT COMPUTATION OF THE COMPLETE TEMPERATURE COURSE UP TO THE REGENERATOR ENDS, IN THE CASE OF VERY WELL CONDUCTING STORAGE MASS. (Exakte Berechnung des Vollständigen Temperaturverlaufs bis zu den Regeneratorenden bei sehr gut leitender Speichermasse.) Helmuth Hausen. Translated by M. I. Weinreich for Sandia Corp. from Excerpts from Wärmeübertragung im Gegenstrom, Gleichstrom und Kreuzstrom, p. 329-45. Springer-Verlag, 1950. 40p.

Mathematical equations are derived to determine the heat transfer in the case of a very well conducting storage mass. (W.L.H.)

13094
HEAT TRANSFER IN BOILING. Heinz Kornbichler and Norbert Kretzinger. AEG Mitt. 48, 30-7(1958) Jan. (In German)

Heat transfer in boiling can only be calculated by means of empirically obtained formulas or diagrams. Although a large number of research results have been published, no comprehensive and interpretive work is found in the literature. It is shown that known numerical material will suffice for obtaining a number of regularities if the effect of a single parameter could be explained by more extensive experimental work. (tr-auth)

13095
HEAT TRANSFER TO LIQUID METALS. S. S. Kutateladze, V. M. Borishanskii, and I. I. Novikov. Atomnaya Energ. 4, 422-36(1958) May. (In Russian)

A review is presented of basic research on heat exchange between solid surfaces and flowing liquid metals. Results are given from experiments with long or short tubes having flat apertures; on the longitudinal flow of molten metal over rod bundles or plates; on the transverse flow over cylinders; and on free convection and vapor condensation of liquid metals. Also, problems connected with liquid metal boiling and the effects of quenching on hydaulic resistance and heat exchange are discussed. Formulas for calculations of heat exchange are included. (tr-auth)

13096
THERMAL DIFFUSION IN LIQUIDS. MEASUREMENTS AND A MOLECULAR MODEL. Stephen Whitaker and R. L. Pigford (Univ. of Delaware, Newark). Ind. Eng. Chem. 50, 1026-32(1958) July.

A theoretical model is presented to explain the effect of several variables on thermal diffusion coefficients.

The apparatus in the investigation was similar to that developed by Tanner. A discussion of the results is given along with a discussion of the causes of error. (J.R.D.)

13097

INVESTIGATION OF THE HEAT RELEASE DURING TURBULENT FLOW OF LIQUIDS IN NARROW CHANNELS OF RECTANGULAR CROSS SECTION. N. V. Tsarenko (Kiev Polytechnic Inst.). Izvest Kiev. Politekh. Inst. 17, 143-53(1956). (Translated from Referat. Zhur. Khim. No. 3, 1957, Abstract No. 10589).

The heat release during cooling by water flowing in channels of rectangular cross section in the region of Re = 1 to 6×10^4 was investigated. The experiments were carried out in three channels with cross sections of 1.8×19.5 mm, 3.2×19.3 mm, and 6.6×19.5 mm of 600 mm length. The test results are expressed by the equation: $Nu = 0.023\ Re^{0.8} \times Pr^{0.4}$, with a maximum deviation of 8%. It was established that the cross section shape has little effect on the rate of heat transfer in the range of turbulence investigated; the introduction of an equivalent diameter makes it possible to take into account the effect of the cross section shape.

13098

HEAT TRANSFER BY MOLTEN METALS. M. A. Mikheyev, V. A. Baum, K. D. Voskresenskiy, and O. S. Fedynskiy. pp. 139-51 in "Reaktorostroyeniye i teoriya reaktorov." Moscow, Izd-vo Akad. Nauk S.S.S.R., 1955. (Translated from Referat. Zhur. Mekh. No. 11, 1957, p. 72)

Heat transfer by mercury, tin, lead, bismuth, sodium, and bismuth–lead and potassium–sodium alloys was investigated. The flow velocities varied from 0.1 to 20 m/sec, the Reynolds number from 1×10^4 to 6.5×10^5, the Prandtl number from 4×10^{-3} to 3.2×10^{-2}, and the specific heat flux from 2×10^4 to 1×10^6 kg-cal/m^2 hr. Criteria for pure and oxidized surfaces based on 600 test points are given. A comparison is made between the test data and existing theories. From an evaluation of a variety of test data a new criterion is proposed in the form of a formula which applies to molten metals as well as to "common" liquids in which the Prandtl number exceeds 0.7. Investigations were also performed on the heat transfer in conditions of natural convection on heated plates and tubes for heavy and alkaline molten metals and their alloys. As a result of the evaluation of the test material, and also from available data on liquids exhibiting low heat conductivity, a single formula for the heat transfer in large volumes, applicable over a wide range of Grashof and Prandtl numbers is offered. The data relative to the hydrodynamic resistance in the flow of liquid metals show that the general formulas of hydrodynamics are applicable. (TCO)

13099

THE EFFECT OF A VOLUME HEAT SOURCE ON FREE CONVECTION HEAT TRANSFER. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 144, Session 20. I. E. Randall and Alexander Sesonske (Purdue Univ., Lafayette, Ind.). New York, American Institute of Chemical Engineers, 1958. 31p.

Heat transfer by free convection to a horizontal cylinder from an ordinary fluid containing a volume heat source occurs in some homogeneous reactors. Several approaches to analytical representation of this problem were attempted including the approximate solution. It was concluded that with a volume heat source present in a fluid being cooled by free convection, the heat transfer coefficient will be slightly higher than its value with no heat source present; that for parametric values of the Prandtl modulus and the temperature difference across the boundary layer, increasing the value of the volume heat source increases the ratio of the heat transfer coefficients for a given cylinder; that for parametric Prandtl modulus and volume heat source, increasing the temperature difference across the boundary layer decreases the ratio of the heat transfer coefficients for a given cylinder diameter; and as the cylinder diameter increases, the incidence of turbulence will occur at smaller values of the temperature difference across the boundary layer. (J.R.D.)

Materials Testing

13100 KAPL-1925

Knolls Atomic Power Lab., Schenectady, N. Y.

NON-DESTRUCTIVE DETERMINATION OF U^{235} CONTENT OF ROD-SHAPED FUEL ELEMENTS BY GAMMA PULSE SPECTROMETRY. W. C. Judd and M. B. Leboeuf. July 17, 1958. 30p. Contract W-31-109-Eng-52. $1.00(OTS).

A gamma pulse spectrometer system was developed for non-destructive measurement of the distribution of U^{235} along the length of rod-shaped uranium-zirconium reactor elements. The same system simultaneously measures their total U^{235} content. The method depends on detection of a relatively penetrating 184-kev gamma ray which is emitted in U^{235} decay. For 0.2-in.-diam. elements, linear response is obtained up to better than 12 wt. % of uranium in uranium-zirconium; changes in the Zircaloy cladding thickness produce only 0.15% error per mil. Reproducibility of measurement of the U^{235} content per inch is ±1.1% (Relative Standard Deviation), and 87% of theoretical response to non-uniformities is obtained at a scanning speed of 8 in./min. Reproducibility of total loading measurement is ±0.6% (Relative Standard Deviation). The system is calibrated by measuring reference fuel elements, and sacrificing some of them to obtain an independent U^{235} determination. The total loading calibration is determined to better than ±1% (Relative Standard Deviation). (auth)

13101

X-RAY ANALYSIS OF CONCRETE STRUCTURES. A. Hoenig. Inzen. stavby 4, No. 6, 254-61(1956). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1700.)

The possibility of applying x rays and gamma rays in the study of concrete structures is confirmed. In-place examinations require the use of light-weight equipment. The following radioisotopes can be used: radium, radon, technical mesothorium, Co^{60}, Ta^{182}, Ir^{192}, and Cs^{137}. Simple and stereographic projections on film strips can be used. Barite concrete is recommended as a shielding material.

13102

SECONDARY EMISSION OF BARIUM ACTIVATED THORIUM OXIDE. B. N. Popov and V. F. Koliverdov. Izvest. Akad. Nauk S.S.S.R.Ser. Fiz. 22, 496-504(1958) May. (In Russian)

Properties of barium activated thorium oxides were studied with the purpose of determining their effectiveness as stable, heat resisting emitters for uses in magnetrons. (R.V.J.)

13103

THE UTILIZATION OF GAMMA RAYS IN TESTING THE SHRINKAGE IN HARD CONCRETE. V. Soroker,

I. Vaynshtok, and L. Kayser. Stroitel. materialy, izdeliya, i konstrukt. No. 5, 18-20(1956). (Translated from Referat. Zhur. Khim. No. 1, 1957, Abstract No. 1699.)

A linear relationship was established experimentally between the residual intensity of an x-ray beam which has been sent through the concrete mixture under investigation (estimated from the number of pulses registered by a Geiger-Mueller counter) and the degree of shrinkage (bulk density) of the mixture. It is proposed to use Co^{60} in the evaluation of the degree of shrinkage of concrete.

Pumps

13104

ELECTROMAGNETIC PUMPS FOR LIQUID METALS. Helmut H. Agena (Deutsche Babcock & Wilcox Dampfkesselwerke, Oberhausen). Atomkern-Energie 3, 249-55(1958) July. (In German)

A survey is given on electromagnetic pumps, which are little known in Germany and which may be of some interest there for nuclear power purposes. Several types are described. The difference between conduction and induction pumps is shown by means of some simple considerations. The range of power of these pumps is reported, and a brief discussion of problems of materials is given. (tr-auth)

Waste Disposal

Refer also to abstract 13512.

13105

GROUND DISPOSAL OF RADIOACTIVE WASTES. C. B. Amphlett. Atomics and Nuclear Energy 9, 242-4(1958) July.

The facilities for disposal of radioactive waste to ground at Hanford, Oak Ridge, Savannah River, and Chalk River are described and the experience derived from them is summarized. (T.R.H.)

MINERALOGY, METALLURGY, AND CERAMICS

13106 AERE-R/R-2525

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME TESTS ON STANDARD ELECTRIC MOTOR INSULATION AT HIGH TEMPERATURES. S. T. Naish and D. M. Harris. May 1958. 14p.

Electric motors designed for high temperature operation were tested at temperatures up to 420°C in an O_2-free atmosphere. (T.R.H.)

Ceramics and Refractories

13107 CRMet-763

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

PRE-IRRADIATION TESTS ON U–Si ALLOYS. L. M. Howe and L. G. Bell. May 1958. 41p. (AECL-646). $1.00(AECL).

Pre-irradiation tests of hardness, density, electrical resistivity, and corrosion resistance as well as metallographic and x-ray examinations were undertaken on Si–U core material, which had been co-extruded in Zircaloy-2, in order that the effect of irradiation on alloys in the epsilon range could be assessed. In addition, a study of the epsilonization of arc-melted material was undertaken in order to gain familiarity with the epsilonization process and to obtain information on the corrosion behavior of epsilonized material. Sheathed Si–U samples in the epsilonized and de-epsilonized conditions were irradiated in the X-2 loop, with a water temperature of 275°C. The samples were examined after 250 Mwd/t and show no dimensional change. (auth)

13108 SC-4122

Clevite Research Center, Cleveland.

PROPERTIES OF LEAD TITANATE ZIRCONATE CERAMICS. Technical Report No. 3 [for] February 1, 1956 to January 31, 1957. Don Berlincourt. May 15, 1957. 101p. Project No. 30135. For Sandia Corp. $7.80(ph OTS); $3.30(mf OTS).

Research done by the Clevite Research Center for Sandia Corporation on solid solutions of lead titanate and lead zirconate is reported. This research was expanded to include lead titanate zirconate modified by off-valency additions. Effects of these additions on the properties of lead titanate zirconate are discussed in this report. (auth)

13109 YAEC-58

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

SILVER BORON-CARBIDE CERMETS (5, 10, 15, AND 20 TO 32 WEIGHT PERCENT BORON CARBIDE). Lawrence Lewis—Jean F. Soppet, ed. June 18, 1958. 20p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

A series of silver, boron-carbide cermets containing between 5 and 32 wt. % boron-carbide was made by cold compacting and sintering. These cermets were metallurgically evaluated for possible use as neutron absorber material in stainless steel clad control rods. (auth)

13110

THERMAL CONDUCTIVITY OF REFRACTORY INSULATING CONCRETE. W. C. Hansen and A. F. Livovich (Universal Atlas Cement Co., Buffington, Ind.). Am. Ceram. Soc. Bull. 37, 322-8(1958) July.

Thermal conductivity data are given for 20 insulating and three dense refractory Lumnite cement concretes. Data for 15 concretes were found in good agreement with a curve established by the authors to show the relationship between thermal conductivity and unit weight of the concrete, whereas the data for the remaining eight concretes deviated from the curve by more than 5%, i.e., in excess of limits of accuracy of the test. The 23 concretes were selected for the tests on the basis of the desired unit weights, which were achieved by various means such as the blending of different aggregates, varying size and type of aggregate, varying the method of placing, and by using air-entraining agents. (auth)

13111

SLIP CASTING OF METALS, CERAMICS, AND CERMETS. P. E. Rempes, B. C. Weber, and M. A. Schwartz (Wright-Patterson Air Force Base, Ohio). Am. Ceram. Soc. Bull. 37, 334 9(1958) July.

Principles and problems in slip casting nonplastic powders are discussed and analyzed. Techniques are presented for slip casting a variety of materials, including metals, carbons, cermets, oxides, carbides,

borides, fluorides, and silicides. A new "film technique" which overcomes mold release difficulties is described.

Corrosion

Refer also to abstracts 13491 and 13493.

13112 BW-3794

Babcock and Wilcox Co. Research Center, Alliance, Ohio.

THE INVESTIGATION OF CORROSION AND MASS TRANSPORT WITH SODIUM IN A FIGURE-OF-EIGHT CIRCUIT. W. Markert, Jr. Aug. 9, 1954. 20p. $4.80(ph OTS); $2.70(mf OTS).

An apparatus for studying corrosion and mass transport under simulated sodium-cooled reactor conditions is described. The operation of the figure-eight loop with sodium on Globeiron specimens is reported. The device met the operation requirements. The Globeiron showed a very slight weight loss, probably from decarburization, and there was no evidence of mass transfer. (T.R.H.)

13113 CF-58-4-131

Oak Ridge National Lab., Tenn.

QUARTERLY REPORT OF THE SOLUTION CORROSION GROUP FOR THE PERIOD ENDING APRIL 30, 1958. J. C. Griess, H. C. Savage, J. L. English, R. S. Greeley, S. R. Buxton, D. N. Hess, P. D. Neumann, S. E. Bolt, and W. C. Ulrich. Apr. 30, 1958. 59p. Contract [W-7405-eng-26]. $9.30(ph OTS); $3.60(mf OTS).

A loop run has demonstrated the chemical stability of a solution containing 0.04 M UO_2SO_4, 0.025 M D_2SO_4, 0.03 M $CuSO_4$ and 750 ppm of nickel as nickel sulfate at 300°C in D_2O but both nickel and copper were lost from solution when the nickel concentration was increased to 1700 ppm. The chemical stability of a solution containing 0.036 M UO_2SO_4, 0.022 M D_2SO_4, 0.009 M $CuSO_4$, 0.013 M $NiSO_4$ and 0.0016 M $MnSO_4$ in D_2O was also demonstrated at 300°C. The corrosion of stainless steel in 0.04 M UO_2SO_4 containing 0.025 M H_2SO_4 and 0.01 M $CuSO_4$ was found to be relatively severe above the critical velocity at 250 and 300°C. The critical velocities observed were 10 to 20 and 30 to 40 fps, respectively at 250 and 300°C. Loop runs in which oxygen was removed from solution have shown that as uranium precipitated excess acid, ferrous and nickelous ions formed. On addition of oxygen to such a solution, uranium dissolved and ferrous ions were oxidized to ferric ions which precipitated from solution. A sixth test of the bellows and stainless steel-Zircaloy-2 transition joint mockup was completed satisfactorily. The total exposure of the mockup was 9153 hr, including 8600 hr on fuel solution, 312 thermal cycles between 300 and 100°C and 518 mechanical deflections. Tests to determine if type 304 stainless steel York mesh would corrode appreciably in uranyl sulfate solutions containing iodine and a hydrogen and oxygen atmosphere at 100°C produced negative results. No significant corrosion of the steel was observed. A solution of 0.04 M UO_2SO_4 containing 0.04 M $BeSO_4$ and 0.005 M $CuSO_4$ proved to be unstable during a 200-hr run at 280°C. Both uranium and beryllium were lost from solution. The addition of 100 ppm ruthenium as ruthenium nitroso sulfate to a 0.02 M UO_2SO_4 solution containing 0.025 M H_2SO_4 and 0.01 M $CuSO_4$ at 250°C provided substantial inhibition of corrosion of stainless steel. However, the inhibition appeared to be due to the substantial quantities of chromium(VI) that formed in the presence of ruthenium. A solution of 0.17 M UO_2SO_4 containing 0.20 M Li_2SO_4, 0.10 M H_2SO_4, and 0.02 M $CuSO_4$ was stable at 280 to 295°C and was only slightly more corrosive to stainless steel at 250°C than 0.17 M UO_2SO_4 without additives. Tests of inhibitors of corrosion of stainless steel in 0.05 M H_2SO_4 at 250°C showed 0.002 M potassium dichromate to be very effective. 0.04 M $MgSO_4$ and 0.05 M Li_2SO_4 also gave substantial inhibition though not so much as expected. 0.02 M UO_2SO_4 had little effect. Stress-corrosion cracking characteristics of a number of alloys were investigated under conditions in which steam-heated pipe bends of the materials were cooled by a spray of chloride-containing potable water. MST Gr 3 titanium and Croloy 16-1 stainless steel did not crack during 5000-hr of exposure. Inconel and Nionel were resistant to cracking during test periods of 1000 and 2000 hr, respectively. Incoloy T cracked in 1000 hr. Cold-formed type 347 stainless steel pipe bends did not crack provided the surface was shot-blasted or cathodically protected with aluminum. Normally, cold-formed bends of the alloy crack during 1000 hr. Annealing of type 347 stainless steel pipes did not completely eliminate susceptibility to cracking but did reduce the frequency of cracks. No cracking of the alloy was experienced during a 1000-hr run in which the cooling water was added slowly enough to allow flash vaporization. Stress specimens of several alloys were tested in distilled water at 300°C containing oxygen and 100 ppm of chloride. Generally, at pH 10.5 the high nickel alloys such as Nionel and Incoloy were more resistant to cracking than the austenitic stainless steels. However, at pH 2.8 they were as susceptible to cracking as the austenitic stainless steels. Croloy 16-1 stainless steel cracked in a 200-hr test at pH 6.5; no cracking occurred, however, during 1500-hr at pH 10.5. Niobium was susceptible to pitting attack by uranyl sulfate solutions at 100°C, acquired a smooth film at 200°C and underwent catastrophic attack at 300°C. Although the general corrosion behavior of type 17-4 pH stainless steel was acceptable in several reactor-related environments, the partially hardened material (37 Rockwell C) was subject to cracking during a 1000-hr test in chloride-free uranyl sulfate solution at 280°C. Croloy 16-1 stainless steel exhibited unsatisfactory corrosion resistance in uranyl sulfate solutions at 100, 200, and 300°C. Rexalloy 33 underwent severe localized corrosion attack in oxygenated distilled water at 300°C. (For preceding period see CF-58-1-72.) (auth)

13114 CF-58-7-104

Oak Ridge National Lab., Tenn.

RELATIONSHIP BETWEEN THE RATE-CONTROLLING STEP OF THE MASS-TRANSFER PROCESS AND DISTRIBUTION OF CORROSION ATTACK. J. L. Scott and J. W. Prados. July 16, 1958. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Equations are derived which relate the distribution of corrosion attack or cold-zone deposits with the rate-controlling step of a system which exhibits a thermal-gradient mass transfer. Characteristic distributions of attack and deposition are illustrated for thermal-gradient mass-transfer processes which are: (1) hot-zone controlled, (2) cold-zone controlled, and (3) both hot-zone and cold-zone controlled and the limitations of the method are discussed. It is concluded that both the hot-zone and cold-zone processes must be understood before the conditions leading to the least undesirable distribution of attack can be specified. (auth)

13115 NRL-5152
Naval Research Lab., Washington, D. C.
CORROSION STUDIES IN DYNAMIC AQUEOUS SYSTEMS AT ELEVATED TEMPERATURE AND PRESSURE. M. Krulfeld, M. C. Bloom, and R. E. Seebold. Apr. 28, 1958. 17p. Project Nos. NS-140-001; NS-200-023; and NR-513-000.

A method has been developed for applying the hydrogen effusion technique to the measurement of corrosion rates in dynamic aqueous systems at elevated temperature and pressure. The results obtained in measured hydrogen effusion rates at a water flow velocity of one foot per second at a temperature of 316°C and a pressure of 2000 pounds per square inch are reproducible and comparison with hydrogen effusion rates in static systems at this temperature shows that the rates are similar in the two cases. The method also appears highly sensitive to local corrosion. Data obtained from hydrogen effusion measurements in a high-flow-velocity (30 foot per second) loop indicate higher corrosion rates at the higher velocity and confirm the sensitivity of hydrogen effusion rates to localized corrosion. The "in situ" effects of oxygen on the corrosion occurring in the high-velocity system at 316°C have been observed visually and are correlated with the hydrogen effusion data. Oxygen appears to inhibit the corrosion process. (auth)

13116 WAPD-CTA(ME)-250
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
APPLICATION OF TYPE 410 STAINLESS STEEL IN CONTROL ROD DIRVE MECHANISM MOTOR TUBES AND OUTER HOUSINGS. J. R. Hunter. June 10, 1958. 10p. [Project No. 65b17]. Contract AT-11-1-GEN-14. $1.80(ph OTS); $1.80(mf OTS).

Results of laboratory testing of stress corrosion cracking properties of type 410 stainless steel are presented. This material was evaluated for control rod drive mechanism motor tubes and outer housings. (W.L.H.)

13117 WAPD-CTA(MEE)-483
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
MECHANICAL PROPERTIES OF TYPE 410 EXPERIMENTAL MOTOR TUBES TEMPERED AT 1150°F. A. Faduska. May 9, 1958. 13p. Includes WAPD-CTA(MEE)-510, Attachment (A): 1150°F TEMPERED TYPE 410 STAINLESS STEEL CORROSION PROGRAM. Eric Rau; Attachment (B): 1150°F TEMPERED TYPE 410 STAINLESS STEEL METALLURGICAL EVALUATION PROGRAM. J. V. Alger. 9p. $4.80(ph OTS); $2.70(mf OTS).

Data are given on the corrosion properties of type 410 stainless steel tempered at 1150°F. Control mechanism-drive motor tubes and some outer housings are constructed of 650°F tempered type 410 stainless steel. Since the stress corrosion resistance of type 410 in the 1150°F tempered condition is superior, the utilization of the 1150°F tempered material is more desirable for this application. The properties of 410 stainless steel hardened and tempered at 1150°F are given. (W.L.H.)

13118 NP-tr-120
PREVENTION OF OXYGEN CORROSION BY MEANS OF HYDRAZINE. P. A. Akol'zin, D. A. Danilenko, B. A. Kolodeznyi, M. A. Kulakov, and I. Kh. Shmuilovich. Translated by J. B. Sykes (U.K.A.E.A. Atomic Energy Research Establishment) from Teploénergetike 4, 96 (1957). 5p.

Preliminary studies of the use of hydrazine hydrate in deoxygenating boiler feed water to prevent boiler corrosion are analyzed. The procedure used at a Russian power station is described. (T.R.H.)

13119
CORROSION PROBLEMS IN THE MANUFACTURE OF PHOSPHORIC ACID FROM ELEMENTAL PHOSPHORUS. J. C. Barber (Tennessee Valley Authority, Sheffield, Ala.). Corrosion 14, 357t-62t(1958) Aug.

The principal materials used in the construction of equipment for the manufacture of phosphoric acid (55-60 percent P_2O_5) from elemental phosphorus are described. This process involves the combustion of phosphorus to form P_2O_5 which is then reacted with water to form the acid. The general application of various metals, ceramics, and plastics in the construction of the processing equipment are discussed. The high temperatures characteristic of the process, as well as the impurities in the phosphorus burned, accelerate corrosion in parts of the system. Mist and impurities in the gas stream also cause some erosion. Methods of coping with these problems have been derived from large-scale tests and from plant operating experience. A highly concentrated phosphoric acid (containing 76 percent P_2O_5) also can be made in the regular equipment. The corrosion problems incurred in the production of this acid are discussed. Typical operating data are given for a phosphoric acid production unit. Other data reported include corrosion rates of Type 316 stainless steel exposed to phosphoric acid at various temperatures and corrosion rates of this material in a Venturi scrubber. Relative corrosion rates of 11 metals are computed with respect to Type 316 stainless steel. (auth)

13120
AN EDDY CURRENT GAUGE FOR MEASURING ALUMINUM CORROSION. W. E. Ruther (Argonne National Lab., Lemont, Ill.). Corrosion 14, 387t-8t(1958) Aug.

The construction of a device for the nondestructive measurement of aluminum corrosion is described. An alternating current bridge measurement of the impedance of a coil containing a corroded aluminum specimen may be directly converted to average metal loss per sq cm. No contacts are required on the specimen and the a-c measurement is quickly and easily performed. A dynamic aqueous corrosion test at 260°C is described in which this method was used. (auth)

13121
OBSERVATIONS ON CORROSION RESISTANCE OF HIGH STRENGTH STAINLESS STEELS FOR AIRCRAFT. John Halbig and O. B. Ellis (Armco Steel Corp., Middletown, Ohio). Corrosion 14, 389t-95t(1958) Aug.

Stainless steels of the precipitation hardening type are used extensively in airframe components. In this paper, compositions and properties of several of these alloys are described. The corrosion performances of the Armco 17-4 PH and 17-7 PH precipitation hardening alloys are compared with those of other hardenable stainless steels. The results of accelerated corrosion tests with these materials in both bar and sheet form are reported for a number of acids of varying concentrations and temperatures. Data also are presented for the new precipitation hardening stainless alloy PH 15-7 Mo. Properties needed in materials used for aircraft structures are itemized. Variables affecting corrosion resistance of precipitation hardening stainless steels are discussed briefly. Other topics covered include resistance to high temperature-high purity water, effects of nitriding, atmospheric corrosion resistance, resistance to sea water, galvanic corrosion, stress cracking, and brazing and welding. (auth)

13122
ON THE PASSIVATING PROPERTIES OF SULFATE IONS. I. L. Rosenfeld and V. P. Maksimchuk (Inst. of Physical Chemistry, Academy of Sciences, USSR). Doklady Akad. Nauk 119, 986-9(1958) Apr. 11. (In Russian)

Sufficient quantities of sulfate ion act as passifiers for the stainless steel. The passivation effect of SO_4^{2-} is conditioned by the presence of chromium and in a lesser degree by nickel. In the presence of chlorine and sulfate ions the processes on the electrode surface are assumed to be adsorptive and the sulfate ion passivation must be caused by its adsorption on the metal surface and its displacement of ions of chlorine. (R.V.J.)

13123
ELECTROCHEMICAL PROPERTIES OF PbO_2 AND THE ANODIC CORROSION OF LEAD AND LEAD ALLOYS. Paul Rüetschi and Boris D. Cahan (Electric Storage Battery Co., Philadelphia). J. Electrochem. Soc. 105, 369-77(1958) July.

The total amount of anodic corrosion of Pb and Pb–Sb alloys in sulfuric acid under conditions of O_2 evolution can be evaluated by measuring the length of the potential plateau (transition time) during the electrochemical reduction of the PbO_2 layers, with a constant current, taking into account self-discharge and degree of utilization of the PbO_2. Using high resolution techniques, a characteristic step in the potential plateau during discharge of the PbO_2 layer was discovered. This step can be attributed to a difference in discharge overvoltage between α- and β-PbO_2. For alloys of the Pb–Sb system, constant current corrosion increases slightly with increasing Sb concentration, whereas oxygen overvoltage decreases and constant potential corrosion strongly increases with increasing Sb concentration. Precise electrode potential measurements of the α-$PbO_2/PbSO_4$ and the β-$PbO_2/PbSO_4$ couple gave 1.7085 ± 0.0005 v and 1.7015 ± 0.0005 v, respectively, vs. H_2 in 4.40M sulfuric acid at 31.8°C. These two oxides have different oxygen overvoltage characteristics. Removal of oxygen from β-PbO_2 results in a new crystalline compound PbO_x with x 1.4 to 1.6, with a pseudo-face-centered cubic orthorhombic lattice. This new compound is a nonconductor. The influence of the oxygen content of the lead oxides on their electrochemical behavior is discussed. (auth)

13124
A CONTRIBUTION TO THE THEORY OF STRESS CORROSION IN Al–4% Cu ALLOYS. William H. Colner and Howard T. Francis (Illinois Inst. of Tech., Chicago). J. Electrochem. Soc. 105, 377-84(1958) July.

Stress cracking of Al–4% Cu alloys was found to be greatly influenced by exposed area of the specimen (small areas showed long time-to-failure). Experiments with grain boundary-grain center couples showed that neither potentials nor couple current were influenced sufficiently by stress to account for the acceleration of failure by stress. At constant applied anodic current, however, stress was found to direct the attack perpendicular to applied stress. The theory of Champion and Logan is substantiated. A refinement is suggested in which the last stages of failure result from direct and rapid local attack on film-free metal. (auth)

13125
ON THE EFFECT OF GASEOUS MEDIA ON THE CORROSION OF ALLOYS AT HIGH TEMPERATURES. S. G. Vedenkin and Ye. L. Kazimirovskaya. Metalloved. i Obrabotka Metal. No. 5, 55-63(1956). (Translated from Referat. Zhur. Khim. No. 3, 1957, Abstract No. 10541).

A survey is presented of the foreign literature from 1951 through 1954. The authors list methods for corrosion testing. Data on the effect of the composition of the gaseous media on the corrosion of alloys, on the effect of V and of its oxides on the heat resistance of alloys, and on the corrosion resistance of highly alloyed alloys and materials used in high-pressure steam boilers are also given.

13126
STUDIES ON THE CORROSION RESISTANCE OF SOLID METALLIC SOLUTIONS. THE SYSTEM Mg–Cd. N. N. Gratsianskii and P. E. Kaluzhnaya. Zhur. Fiz. Khim. 32, 1038-42(1958) May. (In Russian)

The corrosion resistance of solid solutions of Mg and Cd of two different structures was studied in 0.1 N H_2SO_4 and 5% Na_2SO_4 solutions at room temperature. The first structure was formed after annealing at temperatures of transformation of the solid solutions to chemical matcompounds and the second after annealing under conditions excluding the formation of chemical compounds in the solid solutions. Corrosion resistant boundaries of the alloys form in 0.1 N H_2SO_4 at a cadmium content about 20 to 25%. No sharp change is observed in the curves of the composition-corrosion resistance diagram. There was also no abrupt jump noted in the curve depicting the relation between the alloy composition and the steady state potential of the corroding alloy. The corrosion resistant boundary of the Cd–Mg alloys in 0.1 N H_2SO_4 appears with the formation of a 3 μ surface layer of cadmium atoms protecting the alloy from rapid dissolution. The solid Cd–Mg solutions possess the same character of dissolution. (tr-auth)

13127
THE EFFECT OF CHROMIUM ON THE SULFIDE CORROSION OF ITS IRON ALLOYS. A. K. Semenova and P. V. Gel'd (Kirov Ural Polytechnic Inst., Sverdlovsk). Zhur. Fiz. Khim. 32, 1087-94(1958) May.

The similarity of the protective action of chromium in both the oxide and the sulfide corrosion of its alloys with iron was confirmed experimentally. It is shown that in the oxidation of chromium-iron alloys by sulfur, chromium accumulates in the inner scale layer, forming the spinel $FeCr_2S_4$. When the alloy contains over 12% chromium, the inner layer consists predominately of the sulfide spinel, abruptly retarding the diffusion of anions and cations. This renders the alloy corrosion resistant. (tr-auth)

Geology and Mineralogy

13128
THE ROLE OF HUMUS IN THE GEOCHEMICAL ENRICHMENT OF U IN COAL AND OTHER BIOLITHS. A. Szalay (Inst. for Nuclear Physics, Hungarian Academy of Sciences, Debrecen). Acta Phys. Acad. Sci. Hung. 8, 25-35(1957)

Investigations established that the enrichment of U in peats, coals, and other bioliths is caused by adsorption on the humic acid. Adsorption isotherms have been measured and numerically evaluated. The adsorption itself is actually a cation exchange process. The enrichment factor of 1 : 10,000 agrees well with the quotient of the concentration of U in bioliths and natural waters. (auth)

13129
INVESTIGATION OF THE URANIUM CONTENT OF COAL ASHES WITH NUCLEAR EMULSION. E. Bujdoso, L. Medveczky, and A. Szalay (Inst. of Nu-

clear Research, Hungarian Academy of Sciences, Debrecen). Acta Phys. Acad. Sci. Hung. 8, 195-201 (1957).

Ashes of pulverized uraniferous brown coals were embedded in nuclear emulsion. The active grains were examined, and statistics compiled according to shape and number of the emitted tracks. The grains fused into spherical shapes are the carriers of the greater part (70.6%) of the total activity. The average uranium concentration of the spherical grains in the test substance was 0.65%. (auth)

13130

EXPERIMENTATION WITH RADIOACTIVE HYDROGEN-TRITIUM ISOTOPES AS TRACERS IN THE STUDY OF DYNAMICS OF GROUND WATER. Ya. B. Finkel'shteyn, V. A. Filonov, V. N. Soyfer, and M. P. Obukhova. Razvedka i Okhrana Nedr No. 1, 28-35(1958). (In Russian)

Preliminary experiments on the determination of the movement of subterranean waters by the use of tritium are described. The tests were made at the second Oktyabr' deposit in Russia. Different methods of marking the water were examined. The tritium was measured by a method consisting of electrolytic concentration, decomposition of the water, and determination of the tritium activity with a sensitive Geiger-Mueller tube. (J.S.R.)

Metals and Metallurgy

13131 AERE-M/M-193

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

A PRELIMINARY STUDY OF THE PRODUCTION AND PROPERTIES OF BERYLLIUM SHEET. N. A. Hill. Apr. 1958. 17p.

Beryllium sheet has been rolled from hot-extruded, hot-forged, and cold-compacted electrolytic beryllium powder. Room-temperature tensile tests have shown that maximum elongation in the plane of the sheet was obtained from cross-rolled hot-forged powder. Cold-bend tests were able to distinguish between unidirectionally rolled and cross-rolled sheet. The degree of bend proved to be sensitive to strip width and, irrespective of tensile ductility, became negligible above a width of 0.2 ins. for all types of sheet of thickness 0.030 ins. bent around a $^3/_{32}$ in. radius. Wide strips of certain types of fabricated sheet were bent at 650°C using a mild-steel supporting plate or at 300°C unsupported. (auth)

13132 AERE-M/R-2554

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE MECHANICAL PROPERTIES OF URANIUM–MOLYBDENUM ALLOYS. M. B. Waldron, R. C. Burnett, and S. F. Pugh. 1958. 36p. $0.90(BIS).

The tensile properties and hardness of uranium–molybdenum alloys in the composition range 0 to 14 wt. % molybdenum have been studied at room and elevated temperatures. At lower concentrations, the breakdown of the γ solid solution to unstable microstructures leads to pronounced aging effects. Above 5.5 wt. % molybdenum the γ solid solution is retained to room temperature and shows enhanced properties at temperatures up to 800°C. (auth)

13133 AFOSR-TN-58-97

Cornell Univ., Ithaca, N. Y.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF THE ATOMIC PHENOMENA OCCURRING ON AND NEAR THE SURFACES OF SOLIDS. Technical Report No. 6 [on] AN ULTRA-HIGH VACUUM MASS SPECTROMETER FOR THE STUDY OF THE SURFACES OF SOLIDS. Richard C. Bradley. Mar. 1, 1958. 80p. Contract AF18(600)-674. (AD-148146).

A new ultra-high vacuum mass spectrometer for the study of the surfaces of solids is described. Surface atoms are removed either by ion bombardment or by evaporation and are mass analyzed in a 60° sector field mass spectrometer with a six-inch radius of curvature. The design, construction, and operation of the instrument and its associated apparatus are discussed in some detail. The results of certain experiments on the surfaces of three refractory metals (molybdenum, tantalum, and platinum) are presented in order to indicate both the potentialities and the limitations of the instrument in its present form. (auth)

13134 APEX-384

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

EFFECTS OF HIGH TEMPERATURE ON THE PERFORMANCE OF ALNICO V AND ALNICO VI PERMANENT MAGNETS. W. H. Roberts and D. L. Mitchell. Feb. 1957. 90p. Contracts AF33(038)-21102 and AT(11-1)-171. $2.25(OTS).

The effect of temperatures up to 600°C and the combined effect of temperature and vibration on the magnetic performance of Alnico V and Alnico VI magnet were investigated. (auth)

13135 BMI-1247

Battelle Memorial Inst., Columbus, Ohio.

PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING DECEMBER 1957. Russell W. Dayton and Clyde R. Tipton, Jr. Jan. 1, 1958. Decl. Feb. 13, 1958. 56p. Contract W-7405-eng-92.

Creep properties of 15% cold-worked Zircaloy-2 at elevated temperatures are presented. Work has continued on extrusion cladding flat plates utilizing the right-angle tooling. Study of uranium oxide structures has continued with emphasis being placed on determining residual contents in UO_2. Four melting experiments were made using pure uranium dingot stock to measure the total quantity of gas evolution occurring at various controlled temperature levels in the 2000 to 2500°F temperature range. Phase boundaries are presented in the Zr–1 wt. % uranium hydride system. Corrosion test results are presented for gamma-phase uranium alloys. A program is presented that has the objectives of obtaining fatigue information on Inconel along with variables of temperature, stress, strain, time, and cyclic frequency. Several experiments were performed to attempt to produce dense and homogeneous bodies of UO_2 and La_2O_3. The electrical properties of UO_2–metal oxide systems are given. A study of phase relationships existing between the intermetallic phases of the U–Zr and U–Mo alloys is presented. A solid-state study of the ternary system U–N–C is presented. (For preceding period see BMI-1238.) (W.L.H.)

13136 CRMet-782

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

POINT DEFECTS IN PLATINUM. G. R. Piercy. June 1958. 71p. (AECL-648). $1.50(AECL).

An investigation was made of the mobility and type of point defect introduced in platinum by deformation in liquid nitrogen, quenching into water from 1600°C, or reactor irradiation at 50°C. In all cases the activation energy for motion of the defects was determined from

measurements of electrical resistivity. Measurements of density, hardness, and x-ray line broadening were also made where applicable. The interpretation of these experiments indicated that the principal defects remaining in platinum after irradiation and quenching are single vacant lattice sites and pairs of vacant lattice sites, respectively. Those present after deformation in liquid nitrogen are single vacant lattice sites and another defect, perhaps interstitial atoms. (auth)

13137 NAA-SR-2628

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

DIFFUSION OF CERIUM AND ZIRCONIUM IN MOLTEN URANIUM. T. Smith. July 1, 1958. 26p. Contract AT-11-1-GEN-8. $0.75(OTS).

Coefficients for the diffusion of cerium in molten uranium were measured over the temperature range 1170 to 1480°C. An equation relating the diffusion coefficient and temperature is $D = 0.02e^{-15\ Kcals/RT}$ The diffusion coefficient for cerium at 1200°C is 1.0×10^{-4} cm²/sec. The solubility of cerium in molten uranium was measured and found to vary from 1 to 2% by weight over the temperature range 1140 to 1345°C. Experimental errors involved in measuring diffusion coefficients at high temperatures are discussed. (auth)

13138 NACA-TN-4329

Michigan. Univ., Ann Arbor.

INFLUENCE OF HEAT TREATMENT OF MICROSTRUCTURE AND HIGH-TEMPERATURE PROPERTIES OF A NICKEL–BASE PRECIPITATION-HARDENING ALLOY. R. F. Decker, John P. Rowe, W. C. Bigelow, and J. W. Freeman. July 1958. 53p.

Studies were made of the influence of various heat treatments on the rupture properties and microstructure of a 55Ni–20Cr–15Co–4Mo–3Ti–3Al alloy to provide more fundamental information on the relationships between structure and high-temperature properties in alloys of this type. The effects of variations in solution treatment, cooling rate after solution treatment, and aging treatment on the stress-rupture properties of the alloy at 1,600 and 25,000 psi were measured and related to variations in the size and distribution of precipitates within the alloy and to residual rolling effects. (auth)

13139 NP-6830

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

RESEARCH AND DEVELOPMENT OF BRAZING ALLOYS FOR HIGH-TEMPERATURE APPLICATIONS AND RESISTANCE TO OXIDATION. Quarterly Progress Report No. 1 [for] April 1, 1958 to June 30, 1958. Domenic Canonico and Harry Schwartzbart. July 1958. 7p. Project No. 8-(8-7351). Contract AF33(616)-5654.

The first quarter of work has been completed on a program which has as its objective the development of oxidation-resistant brazing alloys containing temperature depressants which can be volatilized during vacuum brazing. The temperature depressant may enhance wettability. The result of the vacuum brazing operation will be a joint with a higher remelt temperature than that at which the brazement was made. Progress during this period has consisted of the assembly and construction of experimental equipment, preparing 13 experimental brazing alloys, determining their liquidus temperatures, and evaluating four of these alloys by brazing Inconel to stainless steel. Insufficient data have been accumulated to permit drawing conclusions as to the feasibility of the approach. (auth)

13140 NP-6843

Fansteel Metallurgical Corp., North Chicago, Ill.

BIBLIOGRAPHY OF COLUMBIUM. L. F. Yntema, S. Allan Kline, and D. E. Deutsch, comps. Aug. 31, 1956. 161p.

This inclusive bibliography contains references from both domestic and foreign published literature on columbium (niobium) and is considered up to date to Aug. 31, 1956. (A.C.)

13141 NMI-1203

Nuclear Metals, Inc., Cambridge, Mass.

FINAL REPORT ON THE FABRICATION OF FUEL TEST RABBITS FOR PHILLIPS PETROLEUM COMPANY. T. Tarpey and P. Loewenstein. May 6, 1958. 20p. Contract AT(30-1)-1565. $4.80(ph OTS); $2.70(mf OTS).

A method of manufacturing "fuel test rabbits" is presented. Fuel test rabbits consist of two concentric fuel-bearing tubes, with two monitor-wire tubes spaced 180° apart in the annulus between the fuel tubes, and two end caps welded to the outer tubes. Holes in the end caps provide access to the monitor wire tubes, and small screws are inserted to plug the holes. Semicircular slots allow coolant to flow through the assembly. Tubes and end caps are made of Zr, the screws are Al. The outer and inner tubes each contain a core of Zr–4.9 wt. % U alloys. (W.L.H.)

13142 NRL-5161

Naval Research Lab., Washington, D. C.

EFFECT OF NEUTRON IRRADIATION ON THE CURIE TEMPERATURE OF A VARIETY OF FERRITES. E. I. Salkovitz, G. C. Bailey, and A. I. Schindler. June 2, 1958. 7p.

Commercially available ferrites were irradiated in the Brookhaven Reactor for a total integrated flux of 1.2×10^{17} nvt (fast), at a temperature of 50°C. None of the samples showed a significant change in the Curie temperature. (auth)

13143 TML-103

Battelle Memorial Inst. Titanium Metallurgical Lab., Columbus, Ohio.

METALLOGRAPHY OF TITANIUM ALLOYS. H. R. Ogden and F. C. Holden. May 29, 1958. 120p. Contract AF18(600)-1375.

Because of the importance of metallography to the technology of titanium and because of the current interest in titanium technology, it is essential that the metallurgists working with titanium understand its metallography. In this report emphasis is placed on the microstructures of titanium and its alloys. The report contains both a general description of titanium metallography as it is affected by composition and thermal treatment and specific illustrations of microstructures of commercial alloys as they are affected by fabrication and thermal treatments. An index is provided for the various structures illustrated in the sections on commercial alloys. A glossary of terms that are often used in describing titanium microstructures is given. Methods of preparing titanium samples for metallographic examination are described. (auth)

13144 WADC-TR-54-270(Pt. IV)

Cornell Aeronautical Lab., Inc., Buffalo.

INVESTIGATION OF THE COMPRESSIVE, BEARING AND SHEAR CREEP-RUPTURE PROPERTIES OF AIRCRAFT STRUCTURAL METALS AND JOINTS AT ELEVATED TEMPERATURES. Period Covered: March 1956 to May 1957. Luke A. Yerkovich. June 20, 1957. 108p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: DESIGN

DATA FOR METALS. Contract AF33(616)-3456. (AD-155570).

A tabular summary of the high-temperature short-time strength properties of a number of test alloys in tension, compression, bearing, and shear is presented. Data representing the bearing creep behavior of 2024-T3 aluminum alloy sheet for a number of variables associated with bearing are included. The creep behavior of several selected joint designs undergoing bearing and shear creep are illustrated as time-deformation charts, and comparisons between the predicted and experimental performances are made. (auth)

13145 WAL-TR-401/300
Watertown Arsenal Lab., Mass.
THE HOT HARDNESS OF TITANIUM AND TITANIUM ALLOYS. F. R. Larson. July 1958. 39p. DA Project No. 593-32-003.

The hot hardness of 27 different heats of titanium and titanium alloys was studied. Tests were conducted on a modified Rockwell machine in an argon atmosphere. Results indicate that low alloy heats lose their hardnesses at a fairly high even rate. On the other hand, high alloy heats hold their hardnesses well up to about 1100°F, and then the hardness drops off very sharply with increasing temperature. The influence of alloying elements in promoting resistance to softening was evaluated at 900°F. Iron was found to be the most effective with the other elements being arranged in order of decreasing effect, as follows: manganese, molybdenum, aluminum, zirconium, and chromium. (auth)

13146 WAPD-ZH-9
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ZIRCONIUM HIGHLIGHTS. July 1958. 23p. Contract AT-11-1-GEN-14. $3.30(ph OTS); $2.40(mf OTS).

Thermal expansivities for 25% cold-rolled and annealed Zircaloy-2 from room temperature to 1000°C were determined in the three principal directions to rolling. An investigation to define the structure and composition of inclusions found in blister-type corrosion defects in Zircaloy-2 is described. (For preceding period see WAPD-ZH-8.) (T.R.H.)

13147 AEC-tr-3287
SURFACE REACTIONS ON STAINLESS STEELS. T. N. Rhodin. Translated for Oak Ridge National Lab. from J. chim. phys. 54, 72-89(1957). 46p.

The characteristic chemical reactions which are produced on the surface of an alloy reflect a dynamic equilibrium between the influence of factors such as the composition of the gaseous phase, the surface structure, the properties of the film, and the composition of the alloy. Three gas-metal reactions on the surface of stainless steels; adsorption, oxidation, and decarbonization are considered. The experimental techniques used were microgravimetry under vacuum, electron microscopy, and the micro-analysis of surface residues. (W.L.H.)

13148 AEC-tr-3321
INVESTIGATION OF THE DIFFUSION OF BORON AND CARBON IN CERTAIN METALS OF TRANSITION GROUPS. G. V. Samsonov and V. P. Latisheva. Translated by Lydia Venters for Argonne National Lab. from Fiz. Metal. i Metalloved. Akad. Nauk S.S.S.R., Ural . Filial 2, 309-19(1956). 20p.

The investigation on the diffusion of B and C in Ti, Zr, Nb, Ta, Mo, and W was performed. On the basis of the x-ray and chemical analysis and also on the basis of the measurements of the microhardness and of the change of weight of the specimen it was established that the diffusion of B and C in all the metals indicated is reactive. It is accompanied by formation of the corresponding boride and carbide phases. The values of the activation energies during the diffusion of B and C agree well with the physical constants of the transition metals and with the corresponding boride and carbide phases. (W.L.H.)

13149 NP-tr-110
ON THE THEORY OF DE-GASSING OF LIQUID METAL BY SCAVENGING GAS. W. Geller. Translated by N. Willis (U.K.A.E.A., Atomic Energy Research Establishment) from Z. Metallk. 11, 213-17(1943). 18p.

A general theoretical treatment of the removal of dissolved gases from liquid metals by a scavenging gas is given. It is assumed that the gas phase and metal phase are in equilibrium so that the limits which can be attained in practice are established. The laws are derived for gas removal by scavenging with bubbles of finite size, for diffusion in one gaseous volume only, and for scavenging with infinitely small bubbles. Application of the theory to removal of CO_2 from H_2O by air and removal of N_2 from steel by CO is described. (T.R.H.)

13150
PREPARATION, PROPERTIES, AND UTILIZATION OF ZIRCONIUM. Khershkovich. An. Rom.-Sov. chim. 11 No. 2, 145-75(1957). (Translated from Referat. Zhur. Khim. No. 1, 1958, Abstract No. 658.)

13151
THE MODES OF DEFORMATION OF α-ZIRCONIUM. Iu. N. Sokurskii and L. N. Protsenko. Atomnaya Energ. 4. 443-7(1958) May. (In Russian)

Large-grain polycrystalline specimens deformed by precipitation were used in studies of α zirconium deformations. The deformation index was determined by the method of double surfaces and by geometric polar surfaces. It was found that α zirconium deforms by slip $(10\bar{1}0)$ in direction $(1\bar{2}10)$ and plane $(10\bar{1}1)$. A series of doubling systems was revealed: $K_1(10\bar{1}2)$, $\eta_1(10\bar{1}1)$, $K_2(1012)$, $\eta(1011)$. and $s = 0.173$; $K_1(11\bar{2}1)$, $\eta(1126)$. $K_2(0001)$. $\eta_2(1120$ and $\theta = 0.629$; $K_1(1122)$. $\eta_1(1123$. and in one case where $K_1(1123)$, $\eta_1(1122)$. (tr-auth)

13152
A PHOTOELASTIC TECHNIQUE FOR STRAIN MEASUREMENT ON FLAT ALUMINIUM ALLOY SURFACES. H. Fessler and D. J. Haines (Univ. of Nottingham). Brit. J. Appl. Phys. 9, 282-7(1958) July.

A technique is described for bonding layers of an epoxy resin on flat aluminum alloy surfaces. Joints which withstood more than 4% strain were obtained by carefully controlled preparation of the metal and the adhesive. Initial birefringence was avoided by curing the joint without external pressure and by slow cooling after finish curing at 65°C. The different types of reflection polariscopes are discussed, and the strain fringe values for the reflecting layer and for the adhesive are estimated. A test of a lug describes an application of the method. (auth)

13153
INVESTIGATIONS OF DIFFUSION IN NICKEL BASE ALLOYS WITH TWO TO EIGHT COMPONENTS. A. J. Shinyaev. Doklady Akad. Nauk S.S.S.R. 119, 702-4(1958) Apr. 1. (In Russian)

Effects of complex alloying on diffusion processes in the Ni–Ti. Ni–Ti–Cr. Ni–Ti–Cr–W–Al. Ni–Ti–Cr–W–Al–B. Ni–Ti–Cr–W–Al–Mo–C. and Ni–Ti–Cr–W–Al–Mo–C–Nb systems were studied at temperatures of 950 to 1250 . Iron with the radioactive isotope

Fe^{59} was used as diffusing element. Results revealed that in 7- and 8-component nickel alloys the diffusion activity is more than doubled in comparison to pure nickel. Results agree with published data on the effects of chemical complexes on the activation energy of diffusion and coincide with the data on alloy stability in transitions from two component alloy to ternary and more complex ones. At 1100° the 8-component alloy reaches the maximum endurance point. The examined data indicate that diffusion and stability are determined, basically, by the same factors. (R.V.J.)

13154

THE INFLUENCE OF OXYGEN AND NITROGEN ON THE SEPARATION OF TITANIUM AND ZIRCONIUM MINERALS BY FLOTATION. I. N. Plaksin and E. M. Chaplygina. Doklady Akad. Nauk S.S.S.R. 119, 756-7 (1958) Apr. 1. (In Russian)

Descriptions are given of selective flotations of titanium and zirconium ores by separation of zirconium into froth product with titanium remaining in the unfrothed state. Flotation is based on a mineral reaction to reagents in presence of nitrogen. Replacement of oxygen by nitrogen followed by flotation in nitrogen flux resulted in high zirconium concentrate 56.68 to 65.84% ZrO_2 and 77 to 79.5% extraction and, 89.64 to 90.47% TiO_2 in the unfrothed state, with 84% extraction. The zirconium concentrate retained only 3 to 5% TiO_2, while rutile contained 6 to 7.5% ZrO_2. The selective flotation of ilmenite–zirconium with small volume of oxygen in the pulp resulted in 60 to 65% zirconium concentrate with 1.75 to 5.5% TiO_2 and 50 to 58% ilmenite with 6 to 19% ZrO_2. It is shown that nitrogen saturation of aqueous media produces effective separation of titanium and zirconium with minimum amount of saturation. (R.V.J.)

13155

TYPES OF EQUILIBRIUM DIAGRAMS FOR TERNARY SYSTEMS BASED ON TITANIUM. I. I. Kornilov and P. B. Budberg (Baikov Inst. of Metallurgy). Doklady Akad. Nauk 119, 942-4(1958) Apr. 11. (In Russian)

Systems with continuous solid solutions of titanium α and β, with continuous solid solutions of β and limited α, and ternary systems with eutectoid and peritectoid transformations are described. Ten basic types of constitution diagrams including all types of titanium interactions in ternary systems are discussed. (R.V.J.)

13156

METASTABLE IRON–CHROMIUM DIAGRAM. A. G. Lesnik (Inst. of Metal Physics, Academy of Sciences, USSR). Doklady Akad. Nauk 119, 978-81(1958) Apr. 11. (In Russian)

Evaluation was made of interatomic energy in iron–chromium alloys, and the alpha-gamma phase equilibrium of the alloy was determined. (R.V.J.)

13157

THE DEOXIDIZING ABILITY OF CARBON IN VACUUM. A. M. Samarin and R. A. Karasev (Baikov Inst. of Metallurgy, Academy of Sciences, USSR). Doklady Akad. Nauk 119, 990-2(1958) Apr. 11. (In Russian)

The pressure dependence of carbon deoxidizing ability was tested with various concentrations of carbon in liquid iron at high vacuum. Experiments indicated that the deoxidizing ability at 1590° is lower than that calculated from the equilibrium reaction constant. Gas-phase pressure changes up to 10^4 times do not affect the deoxidizing property. It was also observed that the effects of vacuum on deoxidation vary with the concentrations of carbon. The complete liquid iron deoxidation is achieved at furnace pressures of 1 to 2 mm mercury. (R.V.J.)

13158

CERTAIN REGULARITIES IN BINARY METAL SYSTEMS. O. S. Ivanov. Doklady Akad. Nauk S.S.S.R. 119, 1142-4(1958) Apr. 21. (In Russian)

Analysis of experimental data for binary systems permitted the determination of general laws related to the diagram characteristics and chemical properties of the components. Equilibrium state diagrams for Ti and U metals of the 3rd period are presented. (R.V.J.)

13159

CONSTITUTION DIAGRAMS—HEAT RESISTANCE OF BINARY SYSTEMS OF TITANIUM–VANADIUM AND TITANIUM–NIOBIUM. V. S. Vlasov and I. I. Kornilov. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 4, 31-5(1958) Apr. (In Russian)

Continuous solid solutions are formed by V and Nb with Ti β phase and limited ones with α phase. The $(\alpha + \beta)$ region in Ti–V at 600°C extends up to 20 wt.% V, and in Ti–Nb up to 50 wt.% Nb. Studies are made of the heat resistance of Ti–Nb and Ti–V with concentrations of V and Nb up to 50 wt.%. (R.V.J.)

13160

THE STRUCTURE AND PROPERTIES OF VANADIUM–MOLYBDENUM ALLOY SYSTEM. V. V. Baron, Yu. V. Efimov, and E. M. Savitskii. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 4, 36-40(1958) Apr. (In Russian)

The microstructure, hardness, microhardness, plasticity, and electroresistance of Mo–V were studied and their melting point was determined. The constitution diagram was constructed. (R.V.J.)

13161

ON THE DISTRIBUTION OF ADMIXTURES BETWEEN THE SOLID AND LIQUID PHASES OF ALLOYS. B. A. Movchan. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 4, 122-3(1958) Apr. (In Russian)

The contact micro-radiographic method was used in studies of silver, copper, and zinc distribution between the solid and liquid phases of binary aluminum alloys. The alloys were prepared from pure components of Al–Ag with 4.8 and 7.3% Ag; Al–Cu with 3.2 and 8.3% Cu; and Al–Zn with 4.98, 10.10, and 14.79% Zn. (R.V.J.)

13162

ON THE THERMAL STABILITY OF ANTIMONIDES OF ALUMINUM, GALLIUM, AND INDIUM IN LIQUID STATE. V. M. Glazov and D. A. Petrov. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 4, 125-9(1958) Apr. (In Russian)

Corrections were made for melting diagrams of Al–Sb, Ga–Sb, and In–Sb and the temperature dependence of Al–Sb, Ga–Sb, and In–Sb viscosity was investigated. (R.V.J.)

13163

EFFECTS OF HOMOGENIZATION OF THE STABILITY OF SUPERCOOLED AUSTENITE IN CHROMIUM–NICKEL–MOLYBDENUM STEEL. I. E. Brainin, A. I. Kondrashov, and V. A. Kharchenko. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 5, 54-8(1958) May. (In Russian)

It was found that homogenization (diffusion annealing) of forged chromium–nickel–molybdenum steel at 1200 to 1250°, considerably reduces the general duration of decomposition of the austenite in the upper and medium subcritical areas, and that the isothermal soaking of super-cooled austenite in chromium–nickel–molybdenum steels at 300° should guarantee a complete decomposition of austenite. (R.V.J.)

13164

VACUUM FLOW STEEL DEGASSING. F. Weston Starratt. J. Metals 10, 465(1958) July.

A steel degassing technique developed and used by the Henrichschutte steel plant in Germany's Ruhr is described. The process, reportedly capable of reducing H_2, N_2, and O_2 contents of all types of steels to those levels obtained by vacuum casting techniques, requires from 12 to 15 min in a 60 to 80-ton ladle. The metal is circulated through a vacuum chamber by low-pressure argon gas. It is adaptable to various steel-making practices. (T.R.H.)

13165

VACUUM CASTING OF STEEL. J. N. Hornak and M. A. Orehoski (U. S. Steel Corp., Monroeville, Penna.). J. Metals 10, 471-5(1958) July.

A vacuum-casting process has been developed which successfully reduces the hydrogen concentration in steels for large forging sections to a level at which the steel is insensitive to flaking. Also, the final hydrogen content of the steel is at a level at which the tensile ductility for aged and unaged specimens is approximately the same. The pressures at which the process is conducted, however, require that special detailed attention be given to the preparation of the equipment and the actual vacuum casting of the steel. With adequate attention, little or no difficulty should be experienced. (auth)

13166

THERMOCHEMISTRY OF OXYGEN STEEL. W. O. Philbrook (Carnegie Inst. of Tech., Pittsburgh). J. Metals 10, 477-82(1958) July.

Oxygen steelmaking processes are evaluated and compared with other processes. The analysis shows that from 0 to 50% scrap may be handled and closer control is possible by the oxygen process. The information presented shows the process to be capable of making excellent low-carbon steel from basic iron on the low side of normal phosphorus content for North American ores. (T.R.H.)

13167

ON THE MAGNETIC ANNEALING EFFECT IN 2% COBALT–COPPER ALLOY. I. INDUCED FERROMAGNETIC ANISOTROPY. Tadayasu Mitui (Univ. of Hokkaido, Sapporo, Japan). J. Phys. Soc. Japan 13, 549-59(1958) June.

The behavior of ferromagnetic precipitates in copper–cobalt alloy containing ~ 2 wt. % cobalt heat-treated with magnetic fields was studied with the object of making clear a physical origin of the induced uniaxial anisotropy observed. The magnitude of magnetic anisotropy induced by magnetic annealing was measured as functions of the aging temperature, aging time, and magnetic field intensity. It has been found that almost all of the experimental results can be explained by the fine-particle behavior of ferromagnetic precipitates. It is shown that the origin of magnetic annealing can be explained by the shape anisotropy of precipitated particles, which is distributed preferentially along the direction of magnetic field applied during annealing. It is also shown that the magnetic annealing affects remarkably the initial precipitation process rather than the overgrowth stage of precipitation. (auth)

13168

THE PACK CARBURISING AND ANNEALING OF 4¼% Ni–Cr–Mo CASE HARDENING STEEL. C. Dawes (Joseph Lucas, Ltd., Birmingham). Metallurgia 58, 3-9 (1958) July.

Various compounds have been used to carburize a 4¼% nickel–chromium–molybdenum steel, and the influence of these on the as-quenched hardness, microstructure, carbon content and annealing characteristic of the carburized case is described. Recommendations are made for a carburizing compound which will prevent the formation of heavy carbide networks and for a standard annealing treatment. This first section of the article is concerned with the carburizing aspect. (auth)

13169

HIGH STRENGTH WELDABLE STEELS. K. J. Irvine (United Steel Cos., Ltd.). Metallurgia 58, 13-23(1958) July.

High strength steels are now being widely used in welded construction. Following a consideration of the requirements of a high strength structural steel is a discussion of the various ways in which steels can be strengthened and the factors influencing weldability. The advantages of a bainitic structure are pointed out. (auth)

13170

METALLURGY IN NUCLEAR ENGINEERING. SURVEY OF THE LITERATURE IN 1957. J. Burkett (Hawker Siddeley Nuclear Power Co., Ltd.). Metallurgia 58, 32-6(1958) July.

A three-part survey of periodical and research report literature (excepting UKAEA reports) is presented. The part presented here deals with materials of construction, their properties, and the effects of radiation on them. The material is divided into sections on: metals in general; ceramics and cermets; irradiation effects in general, Be, B, graphite, Al and Mg, Mo, Nb, Fe and steel, rare earth metals, Ti and V Zr, and liquid metals. (T.R.H.)

13171

METAL IMPREGNATION OF PRODUCTS MADE FROM SILICON CARBIDE. A. N. Novikov. Ogneupory No. 12, 557-62(1957). (In Russian)

The impregnation of silicon carbide with metals and their oxides in the gaseous state was investigated. The furnace used for this operation is described in detail. It was found that the impregnation requires no previous annealing. A tabulation of the properties of the impregnated silicon carbides is given. (J.S.R.)

13172

NONLINEAR EFFECTS IN METALS AT LOW TEMPERATURES. M. I. Kaganov and V. G. Peschanskii (Inst. for Tech. Physics, Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 6, 970-2(1958) May.

An analysis is presented on the possibility of observing deviations from Ohm's law in metals at low temperatures. (auth)

13173

ON THE THEORY OF THE ANOMALOUS SKIN EFFECT IN METALS. V. P. Silin (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. JETP 6, 985-8(1958) May.

The anomalous skin effect is considered, using Landau's theory of a Fermi liquid, as extended to the case of a degenerate electron fluid. It is shown that the information obtained about the Fermi surface by measuring the surface impedance does not depend on the conduction electrons are considered to be a gas or to be a degenerate fluid. The problem of how to define the parameters for an isotropic model of a metal is discussed. (auth)

13174

METALLURGICAL PROPERTIES OF STRUCTURAL BORON STEELS. O. N. Meshcherinova, L. I.

Posysayeva and G. A. Khasin. Stal' No. 1, 75–81 (1958)

A systematic investigation on the smelting of structural boron steels was made to determine the optimum conditions for deoxidation and introduction of the boron into the steel. Special final deoxidation techniques were used in the smelting process. No difficulties were noted in rolling. Tests showed that the hardness increased some with increasing boron content, but it decreased with increasing temperatures. The mechanical properties were determined. It was found that the grain size of the austenite depended on the boron content. The plastic properties, particularly impact strength, decreases with increasing boron content. The deoxidation of the steel with aluminum and titanium and the addition of boron as ferro-boron or ferro-boral improves the grain size and impact strength. (J.S.R.)

13175

WELDING METALLURGY OF Cr–Mo–V STEELS FOR HIGH-TEMPERATURE STEAM-TURBINE COMPONENTS. R. J. Christoffel, R. M. Curran, F. H. Domina, and C. H. Soldan (General Electric Co., Schenectady, N. Y.). Welding J. (N. Y.) 37, 295s–303s(1958) July.

The procedures, including preheat and post-weld heat treatments, which were developed for welding Cr–Mo–V base metal with a ½% Cr–1% Mo electrode using both the manual metal-arc and submerged-arc processes are summarized. The rupture strength of the ½% Cr–1% Mo weld metal, as well as that of other low-alloy-steel weld metals, was evaluated and found to be less than that of the base metal. The effect of composition and heat treatment on the rupture strength of low-alloy-steel weld metals was evaluated. A Cr–Mo–V electrode was developed and qualified for welding the Cr–Mo–V base metal which, in the normalized and tempered condition, had a rupture strength comparable to that of the base metal. (auth)

13176

STRESS RELIEVING OF STAINLESS STEELS AND THE ASSOCIATED METALLURGY. R. A. Huseby (A. O. Smith Corp., Milwaukee). Welding J. (N. Y.) 37, 304s–15s(1958) July.

The residual stresses introduced into martensitic, austenitic, and ferritic stainless steels during welding are discussed. The effects of heating times and temperatures of stress relieving these steels are presented. (W.D.M.)

13177

INERT-GAS TUNGSTEN-ARC WELDING OF TITANIUM FOR NUCLEAR AND CHEMICAL INDUSTRIES. G. M. Adamson and W. J. Leonard (Oak Ridge National Lab., Tenn.). Welding J. (N. Y.) 37, 673–82(1958) July.

A process has been developed and is described by which unalloyed titanium may be field welded using only conventional inert-gas tungsten-arc equipment. The process is applicable to the high-quality individual welds required in field welding for the chemical industry rather than to high-speed repetitive production welds. (auth)

13178

FUNDAMENTALS OF BRAZING FOR ELEVATED-TEMPERATURE SERVICE. M. D. Bellware (International Nickel Co., Inc.). Welding J. (N. Y.) 37, 683–91(1958) July.

The commercially available brazing alloys are evaluated according to their usefulness for elevated-temperature service. The classifications of the brazing alloys considered are silver-base, copper-base, manganese-, gold-, and palladium-base, and nickel-base. For temperatures above 1000°F, the nickel-base alloys have produced the best results. (W.D.M.)

13179

INVESTIGATION OF THE THERMAL PROPERTIES OF SUPERCONDUCTORS. II. N. V. Zavaritskii (Inst. of Nuclear Problems, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1116–24(1958) May. (In Russian)

The specific heat and thermal and temperature conductivity of aluminum and zinc were measured between 1.5 and 0.15°K. Measurements of the normal state specific heat are identical with those obtained at higher temperatures. The heat conductivity of electrons in a superconductor depends exponentially on T_k/T. In this case K_{es}/c_{es} in contrast to electrons of normal metals, depends on the temperature. The results obtained are compared with measurements of the specific heat of other superconductors, and with the microscopic theory of superconductivity. (tr-auth)

13180

A STUDY OF THE STRUCTURAL AND MAGNETIC CHARACTERISTICS OF ELECTROLYTIC FERROMAGNETIC METAL AND ALLOY DEPOSITS IN RELATION TO THE CONDITIONS OF FORMATION. NICKEL. I. Yu. M. Polukarov (Inst. of Physical Chemistry, Moscow). Zhur. Fiz. Khim. 32, 1008–15(1958) May. (In Russian)

Data are presented on the effect of electrolytic nickel deposition (current density, temperature and pH of the electrolyte, surface active additions) on the structural and magnetic characteristics (coercive force, residual induction, initial permeability, and the initial magnetization curve) of the deposits. Effects of electrochemical factors on the magnetic characteristics of nickel coatings, and the high sensitivity of the magnetic characteristics with respect to structural changes of electrolytic deposits are discussed. (tr-auth)

Tracer Applications

13181

RADIOTRACER EXPERIMENTS IN THE MOHAWK RIVER, NEW YORK, TO STUDY SEWAGE PATH AND DILUTION. E. S. Simpson, W. A. Beetem, and F. H. Ruggles (U. S. Geological Survey, Washington). Trans. Am. Geophys. Union 39, 427–33(1958) June.

Sewage from the Knolls Atomic Power Laboratory near Schenectady, N. Y., was dosed with 4.53 curies of P^{32} prior to discharge into the Mohawk River. Its pattern of diffusion was measured in the river with immersible GM-tubes and by sampling. The initial path of sewage was strongly influenced by differences in density between sewage and river due to temperature. During warm months relatively cold sewage moved on the river bottom perpendicularly to river current. For at least the first 800 ft of travel the maximum sewage concentration decreased logarithmically with distance from outfall. The term 'half-distance' (here about 110 ft) is proposed to describe the concentration change. During cold months sewage rose to the river surface and at times was moved upstream by wind. However, when the river temperature was near freezing, the sewage first rose and then sank as the temperature of the sewage-river mixture approached 39°F. (auth)

13182

RADIOACTIVE TRACERS IN HYDROLOGIC STUDIES. Frank L. Parker (Oak Ridge National Lab., Tenn.). Trans. Am. Geophys. Union 39, 434–9(1958) June.

Experiments were carried out in lakes and reservoirs

in Massachusetts to determine eddy diffusion coefficients. The average eddy diffusion coefficient divided by the radius of the eddy was found to be 0.09 ft/sec. Experiments to determine the average velocity of streams and the dilution in streams by use of radioactive tracers were then performed. The diffusion coefficients found in the test of the streams were compared with theoretical diffusion coefficients for straight pipes and found to be larger due to the increased dispersion caused by bends and obstructions in the stream. A mathematical formulation for general use in determining dilution and dispersion in rivers and streams by radioactive tracers was established. A correction is made for the absorption and decay of the isotope depending upon its chemical and nuclear properties. Work is under way to delineate further the absorption coefficients of important isotopes under various conditions leading to a better determination of the eddy diffusion coefficient. (auth)

13183

TRACING MOISTURE MOVEMENT IN SLICK-SPOT SOILS WITH RADIOSULFUR: PART I. J. V. Jordan, G. C. Lewis, and M. A. Fosberg (Univ. of Idaho, Moscow). Trans. Am. Geophys. Union 39, 446-50(1958) June.

Preliminary greenhouse tests using slick-spot soil and associated soil in columns indicated that Co^{60} and S^{35} moved through the soil columns and appeared in the first drainage water. The first field experiments were run south of Boise on the Sebree-Chilcott associated series. Radiosulfur was used in the form of dilute sulfuric acid soaked into absorbent cotton. Each wad was specifically placed in or adjacent to a slick spot. After several months, soil samples from these tagged slick spots indicated that some characteristic water movement had occurred. Improved techniques have been developed and the study will expand to include slick-spot soils in irrigated and dryland areas. (auth)

PHYSICS

13184 AFSWP-939(Pt. II)

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

SURFACE EFFECTS ON BLAST LOADING. INTERIM REPORT V — PART II. SPARK GAP EXPERIMENT: APPARATUS. S. Chapin and E. J. Murray. [nd]. 30p. Project title: RESEARCH AND ENGINEERING SERVICES IN CONNECTION WITH SURFACE EFFECTS ON BLAST LOADING. ARF Project No. D092. Contract AF33(616)-3218.

A high intensity, short duration spark discharge is used to generate a spherical shock wave having properties characteristic of a high energy-to-mass-ratio explosion. The shock wave is detected by a standard Schlieren arrangement using a microflash light source to "stop" the shock. The time interval between the spark discharge and microflash is generated and measured accurately. The present paper describes the experimental apparatus and technique. (auth)

13185 ISC-1030

Ames Lab., Ames, Iowa.

BIBLIOGRAPHY OF TITLES OF ARTICLES IN THE FIELD OF NUCLEAR QUADRUPOLE RESONANCE SPECTROSCOPY OF SOLIDS. R. G. Barnes. May 1, 1958. 37p. Contract W-7405-eng-82. $1.00(OTS).

This bibliography lists the titles of 269 published literature articles. This field has been taken to include the area of quadrupolar effects in nuclear magnetic resonance as well as the basic area of nuclear quadrupole resonance in zero magnetic field. Articles published not later than January 1, 1958, have been included. (W.L.H.)

13186 NP-6835

Illinois. Univ., Urbana.

CRITICAL FIELD MEASUREMENTS ON SUPERCONDUCTING LEAD ISOTOPES. Technical Report No. 11. Daniel L. Decker. July 1958. 90p. DA Project No. 599-01-004. Contract DA-11-022-ORD-992.

The measurement of the isotope effect upon the superconducting critical field of lead has been extended to temperatures well below T_c. In connection with this measurement the nature of the superconducting transition in lead has been studied, and an accurate superconducting critical field curve is reported. An experimental criterion for distinguishing between "reversible" and "irreversible" transitions is presented, and methods of specimen preparation are discussed. (W.D.M.)

13187 NP-6849

Battelle Memorial Inst., Columbus, Ohio.

SPECIAL MEASUREMENT TECHNIQUES FOR THERMOELECTRIC MATERIALS WITH RESULTS FOR Bi_2Te_3 AND ALLOYS WITH Bi_2Se_3. Technical Report No. 1. T. C. Harman and M. J. Logan. June 1, 1958. 17p. Contract Nonr-2316(00).

A new technique has been devised for the accurate measurement of the absolute values of the thermoelectric power and thermal conductivity. The method involves the use of the Peltier heat to maintain a temperature gradient across the specimen. The measurement of this gradient, the voltage across the specimen, and the a-c resistivity allows the calculation of the absolute value of the thermoelectric power and the thermal conductivity. An especially useful feature of the method is that the thermoelectric figure of merit is given in terms of the ratio of voltages. Some results for Bi_2Te_3 and alloys with Bi_2Se_3 are presented. (auth)

13188 NRL-5159

Naval Research Lab., Washington, D. C.

THE SUITABILITY OF PLATINUM, MOLYBDENUM, TANTALUM, AND TUNGSTEN AS HIGH-TEMPERATURE LENGTH STANDARDS. J. L. White. May 22, 1958. 19p. Projects NA 585-001 and NR 510-000.

In view of the increasing need for high-temperature length standards to be used in the design and calibration of apparatus for high temperatures, the thermal expansion data available in the literature for platinum, molybdenum, tantalum, and tungsten have been critically evaluated. The following equations were selected to represent the mean linear coefficient of thermal expansion, $a_m(\Delta l/l_{0°C})$, of well-annealed material:

for platinum: $a_m \times 10^6 = 8.88 + 1.28 \times 10^{-3}t + 0.04 \times 10^{-6}t^2$

for molybdenum: $a_m \times 10^6 = 5.05 + 0.31 + 10^{-3}t + 0.36 \times 10^{-6}t^2$

for tantalum: $a_m \times 10^6 = 6.50 + 0.34 \times 10^{-3}t + 0.12 \times 10^{-6}t^2$

for tungsten: $a_m \times 10^6 = 4.35 + 0.15 \times 10^{-3}t + 0.17 \times 10^{-6}t^2$

where a_m is in $°C^{-1}$, t is the Centigrade temperature, and l is the length of the specimen. At 1000°C the estimated uncertainties in the values of $a_m \times 10^6$ derived from these equations are ±0.04, ±0.20, ±0.15, and ±0.10 $°C^{-1}$, respectively. (auth)

13189 SCTM-237-58(51)
Sandia Corp., Albuquerque, N. Mex.
RESULTS OF A STUDY OF THE PRESSURE DISTRIBUTION ACROSS A SUPERSONIC JET DISCHARGING INTO A STREAM OF MOVING AIR (PROGRAM III-11). J. W. Arnold and W. T. Botner. July 17, 1958. 36p. Contract AT(29-1)-789. $6.30(ph OTS); $3.00(mf OTS).

A tube with a nozzle installed in one end was mounted in a transonic wind tunnel to discharge a high velocity (Mach = 3.92) jet in the same direction as the main air stream. Tunnel test section pressures were varied to simulate ambient pressure at altitudes of 6,000, 10,000, and 16,000 feet. The tests were conducted at tunnel Mach numbers of 0.71, 0.95, and 1.08. Static pressure, pitot pressure, and total temperature measurements were made across the jet at four downstream positions. The data obtained, a description of testing equipment and procedures, and a tabulation of test conditions are given. (auth)

13190 WADC-TR-57-605
Universal Winding Co., Inc. Patterson, Moos Div., Jamaica, N. Y.
CONTINUOUS FEED FUEL CELL SYSTEMS. Period Covered: March 1957 to September 1957. Laurence R. Alexander, Anthony M. Moos, Kenneth I. Rapp, and Robert C. Sommer. Sept. 30, 1957. 112p. Project No. 7-(1-6058)-60280. Contract AF33(600)-34709. (AD-142016).

Experimental results have demonstrated that hydrogen-oxygen fuel cells are capable of yielding usable quantities of electrical power at high efficiencies. A design study is presented of the factors involved in adapting continuous feed fuel cell systems to use as power supplies aboard air vehicles. While it is agreed that the practicality of the designs presented and the real gains that they offer will be realized only after component fabrication and test are accomplished, on the basis of these investigations feed fuel cells already present distinct advantages, making them attractive power sources. Analysis of the design factors involved indicates by using standard engineering methods and techniques and present materials, that all system components are reasonably capable of development within moderate time limits. (auth)

13191 AEC-tr-3288
HALL GENERATORS. Technical Explanations and Model Summary, March 1957. (Hallgeneratoren. Technische Erläuterungen und Typenübersicht, März 1957.) Translated for Oak Ridge National Lab. from publication of Siemens and Halske, Inc. 28p.

The design, construction, and operation of Hall generators are presented. (W.L.H.)

13192 AEC-tr-3310
MEASUREMENT OF THE MOISTURE PERMEABILITY OF FILMS OF SYNTHETIC MATERIALS USING WATER LABELED WITH TRITIUM. E. E. Finkel. Translated for Savannah River Lab. from Zhur. Fiz. Khim. 31, 1650-3(1957). 8p.

A description is given of a method for the measurement of the coefficients of moisture permeability of films of synthetic materials using water labeled with tritium. In the course of the experiment, measurements are made of the water vapor diffusion current through the specimen. The mass of vapor diffusing in a known time interval is estimated from the activity. The coefficient of moisture permeability is calculated from Fick's law using the data obtained for an established stationary diffusion current. The method provides for the maintaining of stationary process conditions throughout the whole experiment, including the times during which the vapor is being removed for activity measurements. The time required for the experiment is determined solely by the sorptive properties of the specimens, i.e., the time taken for the stationary diffusion current to become established. The relative error of the experiment amounts to ~50%. (auth)

13193 AWRE-Trans-9
MAGNETIC HYDRODYNAMICS. C. J. Syrovatsky. Translated by L. J. Goodlet (U.K.A.E.A., Atomic Weapons Research Establishment) from Uspekhi Fiz. Nauk 62, 247-305(1957). 104p.

The fundamental equations of magnetic hydrodynamics and some solutions are presented. The propagation of small perturbations, discontinuity planes and shock waves, intensification of the magnetic field, stability problems, and magnetohydrodynamic turbulence are considered. A bibliography of 145 references is included. (T.R.H.)

13194
INTERPLANETARY BALLISTIC MISSILES: A NEW ASTROPHYSICAL RESEARCH TOOL. S. F. Singer (Univ. of Maryland, College Park). Astronaut. Acta 4, 59-69(1958).

The purpose of the paper is to show that the explosion of an H bomb carried to the moon by means of a missile is completely feasible and approximately equal in difficulty to the firing of an ICBM (Intercontinental Ballistic Missile) with an H bomb warhead; and to show that it is desirable from the point of view of testing, and worthwhile scientifically. These three factors combined, in the author's opinion, make such a project highly desirable. Most of the paper is devoted to the many astrophysical applications of this new research tool; the legal and geopolitical aspects of this operation are beyond the scope of the paper. (auth)

13195
BETA-RAYS FOR COMMERCIAL IRRADIATION. F. R. Paulsen. Atomics and Nuclear Energy 9, 228-30(1958) July.

The application of beta radiation from a linear accelerator to food and drug sterilization, food preservation, and polymerization is discussed. A 30 kw linear accelerator being built at Harwell is described. Results of some preliminary sterilization experiments are given, and the economic aspects are discussed. (T.R.H.)

13196
COBALT RADIATION SOURCES. W. E. Parker (Budd Co., Philadelphia). Atomics and Nuclear Energy 9, 234-5(1958) July.

The facilities of the Budd Co., Philadelphia, for preparing, handling, canning, and applying Co^{60} gamma sources are depicted and described. (T.R.H.)

13197
LOW TEMPERATURE RESISTIVITY OF THE TRANSITION ELEMENTS: RUTHENIUM AND OSMIUM. G. K. White and S. B. Woods (National Research Council, Ottawa, Can.). Can. J. Phys. 36, 875-83(1958) July.

Experimental values are reported for the electrical resistivity of ruthenium and osmium from 2 to 300°K and for the thermal resistivity from 2 to 140°K. The samples were produced by arc-melting pressed pellets of metallic powder in an inert gas atmosphere. Two osmium samples and one ruthenium sample showed a satisfactorily low residual electrical resistance. By grinding these rods to a regular shape, absolute values of resistivity were obtained and the impurity and thermal components of resistivity derived; at room temperature (295°K) we deduce that for ideally pure Os,

$\rho \simeq 9.1\ \mu\ \Omega$ cm and for ideally pure ruthenium $\rho \simeq 7.3\ \mu\ \Omega$ cm. The temperature dependence of the resistivity was markedly different for another ruthenium sample but it seems likely that this was not representative of pure ruthenium. (auth)

13198

REFRACTIVE INDEX OF He^4: LIQUID. M. H. Edwards (Royal Military Coll., Kingston, Ont., Can.). Can. J. Phys. 36, 884-98(1958) July.

Changes in the phase refractive index n with temperature have been measured between 1.6 and 4.2°K at λ = 5462.27 Å, for liquid He^4 at its saturated vapor pressure, using a metal optical cryostat and a Jamin interferometer. A novel adaptation of the Jamin interferometer has been made so that, in addition, an absolute determination of the group refractive index, n_G, could be made using white light of "effective wavelength" 5595 ± 40 Å. When the dispersion correction is made, the phase index for the Hg green line at T_{55E} = 3.700°K is n = 1.026124 ± 0.000035. The relative measurements have been adjusted to this value. The more than 200 experimental points show a random scatter of less than 5×10^{-6} in index. Using Kerr's density data the polarizability is thus $(N_{\theta\alpha})$ = (0.12454 ± 0.00021) $cm^3\ mole^{-1}$ at λ = 5462.27 Å, for liquid He^4 at 3.7°K. Within experimental error $(N_{\theta\alpha})$ is found to be independent of temperature. Thus the refractive index data may be considered as a measurement of the liquid density and coefficient of expansion. The region near the λ-point is of special interest. The expansion coefficient determined from the refractive index, β_n, may be represented within experimental error by $10^3\beta_{nI} = +41.5 + 14.5 \log|T - T_\lambda|$ for $T > T_\lambda$, from about 0.1° above T_λ to within 0.01° of T_λ; and by $10^3\beta_{nII} = -1.5 + 14.5 \log|T - T_\lambda|$ for $T < T_\lambda$, from about 0.1° below T_λ to within 0.002° of T_λ. This implies that the density-temperature curve has both a vertical tangent and a point of inflection at the λ-point; and that the maximum in density occurs about 0.001° above the λ-point. (auth)

13199

RELAXATION THEORY OF TRANSPORT PROBLEMS IN CONDENSED SYSTEMS. Francis H. Ree, Taikyue Ree, and Henry Eyring (Univ. of Utah, Salt Lake City). Ind. Eng. Chem. 50, 1036-40(1958) July.

Transport phenomena in condensed systems, such as flow and diffusion, occur through the relaxation of molecules which are under stress. The rate processes theory is applied to the relaxation process, and an equation for the rate of shear can be derived. Development of the shear formula is presented along with a developmental discussion of Newtonian and non-Newtonian flow. Also included in the discussion is distribution of flow velocities and molecular diffusion. (J.R.D.)

13200

ELECTRICAL AND OPTICAL PROPERTIES OF GeS. Tadaichi Yabumoto (Shizuoka Univ., Hamamatsu, Japan). J. Phys. Soc. Japan 13, 559-62(1958) June.

High-purity germanium monosulfide was prepared, and its semiconducting properties were measured. Samples are obtained by the reaction of germanium and sulfur in vacuum at high temperature and reducing in ammonium gas to remove germanium disulfide. Dark resistivities of evaporated layers and polycrystalline blocks of GeS prepared by the above method are $10^{10}\ \Omega$ cm or more. The thermal activation energy for dark current is 0.74 to 1.0 ev and about 0.25 to 0.5 ev at higher and lower temperature regions, respectively. The absorption edge is found at about 700 mμ from the optical measurements. At room temperature the maximum spectral sensitivity of photoconductivity is observed at the wavelength of about 700 mμ in vacuum and of about 800 mμ in room air. The sign of the observed thermoelectric power is that of p type at high temperature, and its magnitude is about 1 mv/deg. (auth)

13201

ON THE POSSIBILITY OF THE CHARGE DEPENDENT CORRECTION TO THE GRAVITATIONAL FORCES. M. Kawaguchi (Purdue Univ., Lafayette, Ind.). Nuovo cimento (10) 8, 506-7(1958) May 1.

The force due to the Fermi interaction should be discussed to determine if it is important as a small correction to the gravitational force. The accuracy of experiments on gravitational phenomena is extremely high, so that it is desirable to check any small correction. The conclusion from this study is that Fermi interaction does not produce any detectable correction to the gravitational force. (A.C.)

13202

RADIATION FRONTS. A. R. Fraser (Atomic Weapons Research Establishment, Aldermaston, Berks, Eng.). Proc. Roy. Soc. (London) A245, 536-45(1958) July 8.

When intense thermal radiation penetrates into a cold fluid the front separating hot and cold fluid may be well defined. When this is so, conservation laws, similar to those which are used across a shock front, can be applied to the radiation front. These conservation laws, together with the second law of thermodynamics, are used to classify the types of front which can exist. Analogies are drawn between radiation fronts and detonation waves or deflagration waves. (auth)

13203

INVESTIGATION OF THE THERMAL PROPERTIES OF SUPERCONDUCTORS. 1. TIN (DOWN TO 0.15°K). N. V. Zavaritskii (Academy of Sciences, USSR). Soviet Phys. JETP 6, 837-47(1958) May.

Measurements have been made of the thermal and thermometric conductivities of several samples of tin in the range from 0.15 to 4°K. These make it possible to determine the specific heat of tin down to 0.15°K. It has been found that, below 0.45°K, the specific heat is due to the lattice and varies according to Debye's law, with Θ_D = 202 ± 3°K. Above 0.45°K, the specific heat of the electrons appears, which depends on temperature as $c_{es} = A\ (T) \times \exp(-\alpha T_c/T)$. The free energy of the superconducting electrons below 3°K, determined on the basis of these measurements, can be represented as $F_{es} = BT^n \exp(-\alpha T_c/T)$, where $B = 8.7 \times 10^{-4}$ joules/g-mole-deg, n = 2.5 ± 0.5, α = 1.35 ± 0.1. The thermal conductivity of tin below 0.3°K for all specimens is due to the heat transfer by the phonons; one of the samples exhibited a reflection effect of the phonons from the mirror surface. For higher temperatures, the thermal conductivity of the electrons varied for all samples as $K_{es} = \text{const} \cdot \exp(-\beta T_c/T)$, β = 1.45 ± 0.05. The results are discussed from the point of view of the presence of an energy gap in the excitation spectrum of superconductors. (auth)

13204

SOURCE OF PROTONS WITH THERMAL DISSOCIATION OF HYDROGEN MOLECULES. M. D. Gabovich and Z. P. Fedorue. Ukrain. Fiz. Zhur. 1, No. 2, 158-69 (1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8520.)

It is shown that it is possible to increase considerably the yield of atomic ions (up to 85%) in ionic sources by using the thermal dissociation of H_2 in the discharge chamber of the source. In the source developed in this investigation, the discharge takes place in a metal cham-

ber heated to 2500°K. It is shown that increasing the yield of atomic ions causes the thermal dissociation of the H_2 molecules.

13205
AN EXPERIMENTAL STUDY OF ION EXTRACTION CONDITIONS IN AN ION SOURCE. D. D. Gvozdanović (Inst. of Nuclear Sciences "Boris Kidrič"—Beograd). pp. 454-7 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The results of experiments made with an experimental ion source in which the source conditions and electron beam condition were varied are described. The ion source and experimental conditions are described. It was shown that the theory of E. Jordan and N. Coggeshal (J. Appl. Phys. 13, 539(1942)) could be applied to the source only in a rough approximation. The internal extraction field is not homogeneous because of the source geometry and fringing of the external field through the slit in the source region. Moreover, the increased distance of the appearance place from the exit slit of the source influences the secondary reactions. If strong ion beams without secondary ions are desired, the ionization must take place near the exit slit. (J.S.R.)

13206
DIRECT CURRENT MAGNETRON AS ION SOURCE FOR GASES AND SOLIDS. Brana G. Perovic (Inst. of Nuclear Sciences "Boris Kidrich," Belgrade). pp. 813-17 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The possibilities of the use of the d-c magnetron as an ion source were examined, and its characteristics were determined to find its optimal working conditions. It was found that the d-c magnetron can be used successfully as an ion source for gases and metals with a high ion current intensity and good stability. The results showed that improvement could be made in the source efficiency by better construction and an improved power supply. (J.S.R.)

13207
ON THE CREATION OF STRONG ION BEAMS. J. Kistemaker and J. M. Fluit 'Laboratorium voor Massaspectrografie, Stichting F.O.M., Hoogie Kadijk 202, Amsterdam C.). pp. 516-29 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The fundamental limitations in the production of ion beams are reviewed. The requirements for the production of ions are given. In connection with the extraction of the beam, the gas economy of the arrangement, the space charge limitation of the current, the divergence of the envelope of the beam, and the potential distribution along the beam are considered. 30 references. (J.S.R.)

Astrophysics

13208
THE KINETIC TEMPERATURE OF AN ATMOSPHERE SUPPORTED BY RADIATION. II. Alvin H. Davis (Univ. of California, Livermore). Astrophys. J. 127, 118-24(1958) Jan.

The anisotropy of the kinetic temperature of a tenuous atmosphere in an anisotropic radiation field is investigated. The atmosphere is supposed to consist of small particles capable of continuous absorption and emission and assumed to be in pseudo-thermostatic equilibrium. Interparticle collisions are assumed to be of negligible importance. A numerical evaluation of the anisotropy is given for the case of an atmosphere above a surface radiating as a black body. (auth)

Cosmic Radiation

13209 TT-745
ABSORPTION ANALYSIS OF THE STAR-PRODUCING COMPONENTS OF COSMIC RAYS. II. NUCLEAR PROCESSES IN NUCLEAR RESEARCH PLATES. (Absorptionsanalyse der sternauslösenden Komponenten der Ultrastrahlung. II. Kernprozesse in Kernspurplatten.) E. Rössle and E. Schopper. Translated by D. A. Sinclair for National Research Council of Canada from Z. Naturforsch. 9A, 836-51(1954). 38p.

In earlier investigations of the absorption behavior of the star-producing components in carbon, iron, and lead absorbers with nuclear research emulsions, transition effects were noted which showed distinct star frequency maxima. These results were supplemented by various measurements in iron and tin, and various absorper shapes in carbon were tested. The observed maxima consisted entirely of neutral-initiated maxima of the O_n type. Difficulties are encountered in attempting to interpret these results in terms of simple mechanisms involving known particles; the transition effects are calculated for nucleons and high-energy π mesons. With regard to the maxima, no agreement with the experiment is found under the assumptions made for the calculation. In the case of photons, a new calculation of the cascade in lead carried out by Kuhn did not result in any increase of photons capable of star production leading to a maximum. There are arguments of an experimental kind against any participation of μ mesons. (auth)

13210
A COSMIC RAY INCREASE RELATED TO SOLAR ACTIVITY. J. Katzman (National Research Council, Ottawa, Can.). Can. J. Phys. 36, 807-14(1958) July.

An increase in the intensity of cosmic ray particles of minimum momentum at Ottawa, Canada, of 4.5×10^9 ev/c was observed with telescopes of solid angles 11.5×10^{-4} and 26.0×10^{-4} steradians with increase of solar activity. A large increase in cosmic ray activity for the period September 1956 to February 1957 was observed to accompany a large and sustained increase in solar activity as determined by means of the critical frequency of the F-2 layer. (auth)

13211
THE VARIATION OF SEA LEVEL COSMIC RAY INTENSITY BETWEEN 1954 AND 1957. A. G. Fenton, K. B. Fenton, and D. C. Rose (National Research Council, Ottawa, Can.). Can. J. Phys. 36, 824-39(1958) July.

Results from neutron monitors and meson telescopes at Ottawa (geomagnetic latitude 57°N.) and Resolute (geomagnetic latitude 83°N.) are presented for the years 1954–57, a period of increasing solar activity. The results indicate that the sea level meson intensity at these latitudes decreased by 5–6% between April 1954 and December 1957. During the same period the intensity of the nucleonic component at these stations decreased by over 22%. Investigation of the relative response of the two types of recorder to transient decreases during this period indicates that the long term change in the intensity level cannot be explained completely as an accumulation of shorter transient decreases, which become more frequent at times of high solar activity. It is concluded that the transient decreases are superimposed upon the longer term changes, each being pro-

duced by a separate modulation process but ultimately controlled by the general level of solar activity. Significant differences are found in the shape of transient decreases observed at the Canadian stations, both between different components at the one station and the same component at different stations. These may be interpreted as due to a varying energy dependence from one transient decrease to another, and to anisotropy in the primary cosmic radiation at these times. (auth)

13212

MOMENTUM SPECTRUM OF DEUTERONS IN THE VERTICAL COSMIC-RAY FLUX. M. I. Ayvazyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Izvest. Akad. Nauk Armyan. S.S.R. Fiz. Mat. Estestven i Tekh. Nauki 9, No. 3, 91-101(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8874.)

By use of a magnetic mass spectrometer and a double proportional counter, a determination was made of the number of deuterons in the flux of cosmic rays at an altitude of 3200 meters in the momentum range from 0.7 to 1.7 Bev/c, under a lead filter 32 g/cm^2 thick. The spectrum obtained has a sharp maximum at approximately 1.2 Bev/c, and the maximum deuteron flux is 0.75 ± 0.14 cm^{-2} sec^{-1} steradian^{-1} (Bev/c)$^{-1}$.

13213

NEUTRAL V-PARTICLE FROM COPPER AND CARBON. W. A. Cooper, H. Filthuth, L. Montanet, J. A. Newth, G. Petrucci, R. A. Salmeron, and A. Zichichi (CERN, Geneva). Nuovo cimento (10) 8, 471-9(1958) May 1.

The results of a cosmic-ray experiment on the production of neutral V particles in copper and carbon are given. The conclusions are based on the analysis of 51 V° events from copper and 28 from carbon. The ratio of number of Λ^0 particles to number of short-lived θ^0 particles at production is found to be $\sim 1:1$ in copper and $\sim 1:2$ in carbon before allowance is made for the decay modes involving only neutral particles. The momentum spectra found for the V^0 particles agree with earlier results. A possible asymmetry in the decay of Λ^0 particles is discussed, and estimates of the mean lifetimes of Λ^0 and θ_1^0 particles are given. (auth)

13214

COSMIC-RAY INCREASES PRODUCED BY SMALL SOLAR FLARES. J. J. Corrigan, S. F. Singer, and M. J. Swetnick (Univ. of Maryland, College Park). Phys. Rev. Letters 1, 104-5(1958) Aug. 1.

An experiment was designed to detect short-lived or small increases in the low-energy component of total cosmic-ray intensity, observe the structure, and study the correlation in time with small solar flares. The first observations of two unusually short-lived increases in the low-energy portion of cosmic rays measured at latitude 55° geomagnetic and altitude 45,000 ft are reported. The increases were 30% and lasted for two and three minutes. (W.D.M.)

13215

FURTHER OBSERVATIONS ON THE NATURE OF THE CURRENT REDUCTION IN THE PRIMARY COSMIC-RAY INTENSITY. Martin A. Pomerantz and Som Prakash Agarwal (Franklin Inst., Swarthmore, Penna.). Phys. Rev. Letters 1, 107-9(1958) Aug. 1.

It has been established that a sharp cutoff mechanism has reduced the primary cosmic-ray intensity. Although the experimental results which led to this conclusion were entirely consistent with the possibility that the 1958 and 1950 magnetic rigidity spectra differ only with respect to the lower limit, it was not possible to determine whether the form of the spectrum had also changed. Results of experiments with balloon-borne pulsed ionization chambers relating to the form of the spectrum and providing information on the flux of heavy nuclei are reported. (W.D.M.)

13216

STRUCTURE OF EXTENSIVE AIR SHOWERS AT SEA LEVEL. A. T. Abrosimov, N. N. Goryunov, V. A. Dmitriev, V. I. Solov'eva, B. A. Khrenov, and G. B. Khristiansen (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1077-89(1958) May. (In Russian)

The lateral distribution of electrons and nuclear-active and nuclear-passive particles in extensive air showers containing from 4×10^4 to 4×10^5 particles at sea level was studied with correlated hodoscopes. The experimental data indicate that high energy nuclear active particles which determine the development of the shower exist in extensive air showers in the lower layers of the atmosphere. The energy flux of the shower is concentrated in a small region possessing a small radius of the order of several meters from the axis of the extensive air shower. (tr-auth)

13217

ON SOME SOURCES OF THE LOW ENERGY ELECTRON-PHOTON COMPONENT OF THE COSMIC RAYS IN THE STRATOSPHERE. I. D. Rapoport (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1306-9(1958) May. (In Russian)

It is shown that 20 to 30% of the low energy flux (range R < 1.7 g·cm^{-2} Al) observed in cosmic radiation in the stratosphere is genetically related to the products of nuclear disintegrations. (tr-auth)

Crystallography and Crystal Structure

13218 AERE-M/R-873

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

THE GROWTH OF ALPHA-URANIUM UNDER IRRADIATION. S. F. Pugh. Feb. 19, 1952. Decl. July 24, 1958. 16p.

Relations between tensile or compressive yield strength of α uranium and crystallographic direction have been predicted by R. W. Cahn from the observed slip and twin systems reported in M/R-740. These relations are used in conjunction with a development of the model proposed by Wyatt and described in M/R-772 to provide a theory of the mechanism of growth of α uranium under irradiation. The growth behavior of rods having various types of preferred orientation can be deduced from this theory, which also explains why growth is observed in the direction of high tensile yield stress. The theory predicts absence of growth in uranium irradiated at temperatures above those at which deformation occurs by twinning, and has been used by Jones to predict the role of alloying additions in preventing irradiation damage. (auth)

13219 NAA-SR-2538

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

SOLID PHASE TRANSITIONS IN THE UO_2-ZrO_2 SYSTEM. G. M. Wolten. June 15, 1958. 19p. Contract AT-11-1-GEN-8. $0.75(OTS).

Several aspects of the UO_2-ZrO_2 system have been studied and the following conclusions reached: (1) At 2300°C, the UO_2-ZrO_2 system consists of a homogeneous phase extending from 0 to 100 mole % ZrO_2. The crystal structure of this phase changes in a continuous

manner from cubic to tetragonal with increasing ZrO_2 content. The lowest ZrO_2 concentration at which the structure has been recognized as tetragonal lies between 53 and 54 mole %. (2) The temperature at which pure ZrO_2 transforms from a monoclinic to a tetragonal structure is lowered drastically by additions of UO_2. (3) The existence of a cubic high-temperature modification of ZrO_2 appears unlikely. (auth)

13220

A METHOD FOR GROWING SMALL SPHERICAL CRYSTALS OF METALS AND ALLOYS. A. E. Ray and J. F. Smith (Iowa State Coll., Ames). Acta Cryst. 11, 310 (1958) Apr.

A method of growth of small single crystals which are nearly perfect spheres is presented. The corrections for absorption effects in crystal diffraction peak measurements are most easily made with these crystals. Crystals of several different diameters are produced in one operation, and diffraction peak intensity data taken from crystals of different size give information concerning the relative importance of primary and secondary extinction effects. (J.R.D.)

13221

CONTROL OF LINEAGE STRUCTURE IN ALUMINUM CRYSTALS GROWN FROM THE MELT. K. T. Aust (General Electric Research Lab., Schenectady, N. Y.) and B. Chalmers (Harvard Univ., Cambridge, Mass.). Can. J. Phys. 36, 977-80(1958) July.

The formation of regular, continuous, straight, low-angle boundaries (striations) during freezing of a metallic crystal may be avoided by inclination of the advancing solid : liquid interface with respect to the direction of freezing. (auth)

13222

THE STRUCTURE OF THE ABSORPTION AND PHOTOELECTRIC CONDUCTANCE SPECTRA OF CdS CRYSTALS AT 20°K. V. L. Broude, V. V. Eremenko, and N. N. Chikovani (Inst. of Physics, Academy of Sciences). Doklady Akad. Nauk 119, 911-13(1958) Apr. 11. (In Russian)

The light absorption coefficients of CdS crystals in a shortwave area were measured, and a quantitative evaluation was made of line intensity changes related to lattice deformations. To establish the nature of photoconductivity, the spectral distribution of absorption coefficient was correlated with the spectral distribution of stable photocurrent. (R.V.J.)

13223

ELECTRON SPIN RESONANCE OF Z_1-CENTERS IN POTASSIUM CHLORIDE. Hazimu Kawamura and Keiko Ishiwatari (Osaka City Univ.). J. Phys. Soc. Japan 13, 574-8(1958) June.

The paramagnetic resonance due to Z_1 center electrons in potassium chloride is investigated. Since Z_1 centers are always accompanied by F centers, the contribution from F centers ought to be substracted from the resultant curve in order to get the absorption curve due to Z_1 centers alone, which is found to be Gaussian with the half-width of 79 oersteds and g value of 1.999. The result is analyzed according to the model that an electron is trapped by a divalent cation substituted for a cation of the bulk crystal. (auth)

13224

MAGNETIC ANISOTROPY MEASUREMENTS OF NiO SINGLE CRYSTAL. Hisamoto Kondoh and Enji Uchida (Univ. of Osaka Prefecture); Yoshihide Nakazumi (Tochigi Chemical Industrial Co., Ltd., Osaka); and Takeo Nagamiya (Osaka Univ.). J. Phys. Soc. Japan 13, 579-86(1958) June.

The magnetic anisotropy of NiO single crystal grown by the Verneuil method was measured using a torque balance. An x-ray study showed that the crystal, despite its outward appearance of a single crystal, is composed of small rhombohedral domains twinned through {100} planes. By applying a pressure along one of the [111] axes of the crystal during annealing from above the Néel temperature, the twin structure was partly removed. Torque measurements in a homogeneous magnetic field and their analysis showed that in pressure-annealed crystals domains with trigonal axis pointing along the direction of the pressure dominate but antiferromagnetic domains in each crystallite are distributed at random. The spin axis was found to be in the plane perpendicular to the trigonal axis within ±16°. (auth)

13225

FINE STRUCTURES OF X-RAY ABSORPTION BY THE SINGLE CRYSTAL OF GERMANIUM. Kenjiro Tsutsumi and Masayoshi Obashi (Osaka Univ.). J. Phys. Soc. Japan 13, 591-6(1958) June.

The fine structures of x-ray absorption by single crystals of germanium were investigated. These crystals were used as an analyzing crystal of a spectrometer and at the same time as an absorber. The intensities of general radiation reflected from (100), (110), and (111) planes were investigated. The fine structures of intensities reflected from these planes were in agreement with those of absorption spectrum reported by Doran and Stephenson. The observed fine structure of the absorption can be interpreted in terms of Kronig's theory, while the absence of the fine structure near the absorption edge is due to the anomalous scattering of germaninum and to the thickness effect. (auth)

13226

CALCULATIONS ON THE DOUBLE REFRACTION OF SOLID HELIUM. R. Kronig and R. K. M. Sonnen (Laboratorium voor technische physica der Technische Hogeschool, Delft, Netherlands). Physica 24, 432-6 (1958).

The double refraction of solid helium, which crystallizes in a hexagonal lattice, is computed as a function of the ratio c/a of the lattice parameters in a range about the value 1.633 corresponding to closest packing of spheres. The atoms are assumed to be isotropic as regards their optical scattering. The lattice sums are evaluated by the method of Ewald. The results permit to determine the ratio c/a from double refraction measurements with greater precision than is possible at the hand of x-ray structure analysis. (auth)

13227

A NEW METHOD FOR RADIOGRAPHIC STRUCTURE ANALYSIS USING COUNTERS. Hans Neff. Siemens-Z. 32, 379-84(1958) May. (In German)

The counting tube diffractometer can be used for the determination of fiber textures when it is used in conjunction with a revolving unit. A practical example is given. A supplementary contour attachment permits the analysis of single crystals. This method is compared with the photographic revolving-crystal method. The possibility of azimuth definitions with the aid of single reflections is discussed. A procedure is outlined for the adjustment of a crystal so that one of its zonal axes becomes the axis of rotation. (tr-auth)

13228

DEPENDENCE OF THE HYPERFINE STRUCTURE OF F-CENTERS ON THE ORIENTATION OF THE CRYSTAL IN AN EXTERNAL MAGNETIC FIELD. M. F. Deigen and V. Ya. Zevin (Inst. of Physics, Academy of Sciences,

USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1142-7(1958) May. (In Russian).

The spin-Hamiltonian for the interaction between an F-center electron and the angular momenta of the first and second coordinational spheres surrounding the nuclei were obtained by using the continual and orbital model of F-centers in KCl-type lattices. The dependence of the frequency of spin-nuclear transitions on the orientation of the crystal in an external static magnetic field is considered. Comparison of theory with experiment leads to satisfactory agreement between the angular dependences and (to order of magnitude) of the spin-Hamiltonian coefficients. The square of the F-center wave function in the potassium and chlorine sites of the lattice were determined by comparing with experiment. (tr-auth)

Electrical Discharge

13229

INVESTIGATION OF AN IONIZED GAS BY MEANS OF A WEAK ELECTRIC ALTERNATING FIELD. I. FREQUENCY DEPENDENCE OF THE CONDUCTANCE AND CAPACITY, DETERMINATION OF THE ELECTRIC CARRIER. Angelika Székely (Universität Graz, Austria). Acta Phys. Austriaca 12, 91-107(1958). (In German)

It was shown that by means of the alternating field method, which consists of the measurement of the conductance and capacitance of a condensor filled with ionized gas, knowledge can be gained on the nature and properties of the electric carrier in gas. In an example of an incandescent cathode discharge in He confined in a very small space at 0.5 mm pressure, it is shown how the build-up of various discharge states can be observed by gradual increases of the operating voltage. By extension of the measurements to a much greater frequency range, 0.02 to 14 MHz, an analysis of the conductance can be performed: the individual contributions are determined by the varying characteristics of the free electrons and their densities. (tr-auth)

13230

ON THE STATISTICS OF PLASMAS. (THE DYNAMIC BASIC EQUATIONS OF A CLASSICAL STATISTICS OF PLASMA). Paul Stefan Plitter and Fritz Sauter (Institut für theoretische Physik der Universität, Cologne). Ann. Physik 1, 4-15(1958). (In German)

The dynamic basic equations of a statistical plasma theory were derived. It was assumed that the plasma consisted of electrons, positive ions, and a neutral gas. The basic equations consist of a series of partial differential equations by which the behavior of the plasma in local and momentum space is defined. An extension of the theory to the case where varying kinds of ions or neutral gas are present is possible without difficulty. Various assumptions must be introduced to confine the theory, which is exact, to the region of its applicability. Symmetry of the particles was assumed, and it was further assumed that all processes conformed to the laws of classical physics. Therefore, ionization, recombination, and the excitation of degrees of freedom are excluded. The fields carried by the charge carrier were obtained by power development from 1/c by means of fields derived from the Wiechert potential. Only the first member was considered in the electric and magnetic fields. By simple reduction one obtains the Maxwell equations. (tr-auth)

13231

INVESTIGATIONS ON THE RANGE OF EXISTENCE OF THE ELECTRODELESS RING DISCHARGE. H.-J. Strauss (Deutschen Akademie der Wissenschaften, Berlin). Ann. Physik 1, 281-95(1958). (In German)

In the frequency range between 4 and 8 MH_z the limit of existence is given for the electrodeless ring discharge as a function of the pressure and the exciting frequency for the rare gas and mercury, nitrogen, oxygen, bromine, and iodine. The fields which produced the ignition of the discharge and those which effected the sheath in the ring discharge were determined as a function of the coil voltage. The installation used for the investigations is described. (tr-auth)

13232

PHYSICAL LIMITATIONS FOR ENERGY PRODUCTION BY FUSION. II. H. Grümm. Atomkern-Energie 3, 266-72(1958) July. (In German)

The final part of a survey on the physical limitations and possibilities of controlled nuclear fusion is presented. In this section, the discussion of the theory of nuclear fusion is completed. The special properties of completely ionized gases and the present state of experiment with special emphasis on the ZETA are described. 64 references. (J.S.R.)

13233

ZETA'S NEUTRONS. Basil Rose. New Scientist 4, 214-15(1958) June 19.

It was believed that the first controlled thermonuclear reaction had been achieved in ZETA as many neutrons were observed when an electrical discharge in deuterium was maintained for several milliseconds at a temperature of the order of 3×10^{6}°. However, it was noted that, contrary to expectations, the neutron yield was reduced when the deuterium pressure was increased. To determine if the neutrons were thermonuclear in origin, measurements were made, using a high pressure hydrogen filled diffusion cloud chamber, of the dependence of the neutron energy on the direction of emission. The energy of neutrons from a thermonuclear reaction should be independent of the direction of emission. There was a significant difference between the energies produced under normal conditions of current flow and reverse conditions. Possible explanations for the origin of the neutrons are discussed. (J.S.R.)

13234

THE SCALING LAWS FOR THE STABILIZED PINCH. R. J. Bickerton and H. London (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Proc. Phys. Soc. (London) 72, 116-20(1958) July.

The scaling laws for the stabilized pinch are derived. The recent results obtained with such discharges are considered in the light of these relations. (auth)

13235

THE STABILITY OF THE PINCH. S. Chandrasekhar, A. N. Kaufman, and K. M. Watson (Los Alamos Scientific Lab., N. Mex.). Proc. Roy. Soc. (London) A245, 435-55(1958) July 8.

The stability of a cylindrical plasma with an axial magnetic field and confined between conducting walls is investigated by solving, for small oscillations about equilibrium, the linearized Boltzmann and Maxwell equations. A criterion for marginal stability is derived; this differs slightly from the one derived by Rosenbluth from an analysis of the particle orbits. However, Rosenbluth's principal results on the possibility of stabilizing the pinch under suitable external conditions are confirmed. A dispersion relation appropriate for plane hydromagnetic waves in an infinite medium is obtained. This relation discloses under the simplest conditions certain types of instabilities which may occur in plasma physics. (auth)

13236
INVESTIGATIONS OF PLASMA BY MEANS OF MICRORADIOWAVES. M. D. Raizer and I. S. Shpigel. Uspekhi Fiz. Nauk 64, 641-67(1958) Apr. (In Russian)

Microwave methods are adapted to the investigation of plasma and the processes which take place in it. Data are presented on the behavior of charged particles in plasma. The conductivity and dielectric constant of ionized gas, the resonator method, the waveguide method, and the cross-modulation methods are used in the study. The results show that microwaves do not explain all the gas discharge processes but illustrate the possibilities of applying these methods. (R.V.J.)

13237
KINETIC THEORY OF MAGNETOHYDRODYNAMIC WAVES. K. N. Stepanov (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1292-1301(1958) May. (In Russian)

Propagation of magnetohydrodynamic waves in an ionized gas is considered with account of thermal movement of the electrons and ions. (tr-auth)

13238
REDUCTION OF THE KINETIC EQUATION FOR COULOMB COLLISIONS TO A DIFFERENTIAL EQUATION. B. A. Trubnikov (Moscow Inst. of Engineering Physics). Zhur. Eksptl'. i Teoret. Fiz. 34, 1341-3(1958) May. (In Russian)

The kinetic equation for the particle distribution function in totally ionized plasma is analyzed. It is shown that the specific structure of integrals in the expression of flux permits the introduction of new unknown potential functions which reduce the integrodifferential kinetic equations to purely differential. (R.V.J.)

13239
PROBLEMS AND POSSIBILITIES OF ATOMIC FUSION. Wolfgang Ehrenberg. Garmisch-Partenkirchen, Moser-Verlag, 1958. 44p. (In German)

A short and general introduction to the problems and possibilities of nuclear fusion is presented. A brief survey of the future power needs of the world and of the historical investigations on nuclear fusion leads to an introduction to the nuclear physics. The theories and experimental approaches to nuclear fusion are then discussed, such as moving shock compression, stationary compression waves, magnetic walls, magnetic condensation, and plasmoids. The possibilities for the recovery of energy from fusion reactions are discussed. Radiation protection, control, and availability of fusion materials are described as some of the problems which must be solved. Briefly the technical and economic prospects for nuclear fusion are surveyed. 65 references. (J.S.R.)

13240
OBSERVATION ON TRANSIENT PINCHED DISCHARGES. K. W. Allen, H. A. B. Bodin, S. C. Curran, and R. A. Fitch (A.W.R.E., Aldermaston). pp. 26-32 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The design of straight transient pinched discharge equipment is described, and preliminary results obtained with it are discussed. The results refer to examination of the problems of the effect of adding impurities to the deuterium, the effect of applied axial magnetic fields, and the failure to observe x radiation. The tube was operated in the range 25 to 200 microns with deuterium of ~99.9% purity. The average yield per shot was 10^5 neutrons, which appeared mainly at the time of the third pinch. The neutron yield appeared to be relatively unaffected by the addition of nitrogen and air as impurity up to about 2% by volume. Above 11% the emission was less than the threshold value for detection. The neutron emission was not characterized by any unusual features on the voltage-time curve. The application of an axial magnetic field reduced the neutron yield. The current at the time of neutron emission was of the order of 250 ka in the absence of an external magnetic field. In an attempt to observe x radiation caused by acceleration fields within the plasma, the tube was filled with hydrogen, but no x radiation was detected. Possible origin of the neutrons was discussed. (J.S.R.)

13241
EXPERIMENTS WITH A RING DISCHARGE OF SHORT DURATION. J. E. Allen and P. Reynolds (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 33-9 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A brief description is given of experiments in which a high-current discharge is rapidly established in a toroidal tube. The work was done to see if the production of shock waves in this type of system could provide an alternative method to Joule heating for the production of a high-temperature plasma. The discharge gases were argon, hydrogen, and helium. The observation of shock waves in argon and the induced voltage (back E.M.F.) resulting from the rapid contraction of the discharge show that energy is delivered to the gas by electromechanical forces. The results obtained in hydrogen, where the sound transit time is short compared with a half-cycle of current, suggest that stabilization of the discharge is desirable if a very high-temperature plasma is required. The ionization temperatures were obtained for helium at different pressures. (J.S.R.)

13242
INSTABILITIES IN HIGH CURRENT DISCHARGES. T. K. Allen (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 40-9 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A preliminary report is given of experimental work on the nature of the kink instabilities. In these experiments glass racetrack tubes were used in an attempt to obtain the simpler conditions of straight geometry without the additional complication of electrodes. The methods of observation included streak and single shot photography and interferometric measurements. The experiments indicated the existence of a rotating helical luminous channel with component velocities across the axis of the tube of between 2×10^5 and 7×10^5 cm/sec. As this motion makes some contribution to the Doppler broadening, the total width is not a measure of the true thermal energy. It is possible that the positive ions do not necessarily travel at the same velocity as the center of the luminous channel since the Doppler broadening due to ion velocities corresponding to the wriggle velocities measured from streak photographs would be greater by a factor of two or more than the measured broadening. (J.S.R.)

13243
HIGH CURRENT DISCHARGES IN AXIAL MAGNETIC FIELDS. R. J. Bickerton (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 101-9 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The effect of an externally applied axial magnetic field on the contraction and stability of a high-current discharge is considered. The criteria which must be satisfied if the discharge is to be both stable and fully contracted are derived and analyzed. It is shown that the discharge behaves in approximate agreement with simple theory. (J.S.R.)

13244

AXYSYMMETRIC CONFIGURATIONS IN MAGNETO-HYDRODYNAMIC EQUILIBRIUM. L. Biermann, K. Hain, and R. Lüst (Max Plank Institut für Physik, Göttingen, Germany). pp. 110-11 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The configurations of axial symmetry and torus-like character in complete magneto-hydrostatic equilibrium are considered. It is concluded that for axial symmetrical configurations with surface currents, equilibrium can be reached only if the surface current has at least an azimuthal component and if the magnetic field of external origin fulfills certain conditions resulting from the boundary conditions at the surface of the plasma torus. (J.S.R.)

13245

HIGH-FREQUENCY GAS-DISCHARGE BREAKDOWN IN THE PRESENCE OF MAGNETIC FIELDS. Sanborn C. Brown (Massachusetts Inst. of Tech., Cambridge). pp. 169-90 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The principal modifications of the a-c gas discharge breakdown when a magnetic field is superimposed on the discharge tube are summarized. The controlling mechanisms considered are diffusion, oscillation-amplitude limit, mean-free-path limit, electron-resonance breakdown, and E-B containment. (J.S.R.)

13246

GENERAL PROPERTIES OF HIGH FREQUENCY DISCHARGE AS A SOURCE OF CONTINUOUS CURRENT. M. Chenot (Ecole Normale Supérieure des Jeunes Filles, Paris). pp. 191-5 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In French)

During a high-frequency discharge in an ionized gas there appears a continuous electromotive force. A study was made of this force and of the beginning of the corresponding current in an exterior circuit at various frequencies and pressures for a discharge in hydrogen. At a given frequency the polarity of the discharge tube can change with constant pressure by a variation of the excitation, or with constant excitation by a variation of the pressure. The variation of current intensity with pressure was discussed for various frequencies. The positions of the internal electrodes are critical for the appearance of the continuous current. A brief discussion is given of the theoretical interpretation of the results. (J.S.R.)

13247

THE PLASMA RESONATOR. Adam Dattner (Royal Inst. of Tech., Stockholm). pp. 215-27 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Studies were made of the plasma resonance effect when the plasma is situated in a waveguide. The appearance of the resonance curve and the impedance of a plasma column were investigated in detail. The noise generated by the plasma resonator and the decay time of the electron density were measured. The influence of the gas density on the discharge was investigated in order to discover the part played by collisions in the plasma. An attempt was made to establish the properties of the resonance curve in a magnetic field and for different geometric shapes of the column cross section. Resonance curves obtained for different experimental conditions are given. (J.S.R.)

13248

A QUASI-EQUILIBRIUM ELECTRON GUIDE FIELD. D. dePackh (Naval Research Lab., Washington). pp. 236-48 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The equations for the acceleration and injection of protons and electrons in a steady-state relativistic pinched beam are derived. The equations derived represent the secular behavior of the beam and include time derivatives so that short-lived conditions as well as equilibrium configurations can be investigated. (J.S.R.)

13249

ON THE THEORY OF LINE BROADENING IN PLASMA. G. Ecker (Universität, Bonn). pp. 266-75 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The theoretical interpretation of the measured profile of the Balmer lines, used in collecting information on the properties of plasma, is based on the assumption that the predominant effect is caused by the ions. As recent information seems to show the necessity for a reconsideration of the theoretical background, the calculation of the microfield probability function and the influence of electron impact broadening were reexamined. It was shown that the probability function changes with the parameter $\delta = 1.4 \times 10^3 (T_+ \times T_- / T_+ + T_-)^{\frac{1}{6}} \times n^{\frac{1}{6}}$ where T is the temperature. The calculations also show that the influence of electron collisions cannot be neglected and that electron collisions cause a flattening of the line profile at densities as low as 10^{13}. (J.S.R.)

13250

THE GLOW TO ARC TRANSITION IN THE COLUMN AND AT THE CATHODE OF A HYDROGEN DISCHARGE. H. Edels (Univ. of Liverpool). pp. 276-84 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Although a glow-to-arc transition is usually defined solely with respect to the changes in cathodic condition, observation shows a marked difference between the columns normally obtained with glow and arc discharges. A survey of data on this problem shows that despite many postulated mechanisms the existence of any one mechanism has not yet been conclusively verified. As it is certain that arc emission and glow-to-arc transitions are sensitive to cathode surface conditions, experiments were made to clarify the effects of cathodic condition. Preliminary work showed that the columnar and cathodic transitions are independent and that investigation of the associated properties requires oxygen-free hydrogen and clean electrode conditions. From a study of the column transition it appears that the arc column is first formed when the column constriction occurs and that the formation is dependent on the attainment of fixed temperature conditions. The effects of gap variation on the constriction current value support the view that the

critical excitation temperatures reflect a general necessary critical thermal condition in the arc column. The variation in zero-length voltage indicates a continuous cathodic glow-to-arc transition. With contaminated or irregular tungsten cathodes sudden discontinuous transitions were obtained which closely resembled the effect observed in copper cathodes. An investigation of the effects of surface conditions showed that the presence of an oxide film is not sufficient for the induction or irregularities, but the oxide must be in the form of an irregularity. (J.S.R.)

13251

THE CHARACTERISTICS OF ARCS LENGTHENED BY A MAGNETIC FIELD. A. Eidinger and W. Rieder (Technische Hochschule Wien). pp. 285-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

An arc in a transverse magnetic field moves perpendicular to both the field strength and the axis of the arc column. The movement of the arc through the air raises the energy losses, and therefore the arc voltage of the magnetically blown arc is greater than that of the stationary one. The arc gradient increases with increasing field strength or velocity by a factor f, which is graphed for the angles 0, 45°, and 180°. The equation for the lengthening velocity is derived for divergent electrodes. The calculated values for the variation of current during lengthening of the arc between divergent electrodes agree closely with measured values. (J.S.R.)

13252

CLASSIFICATION AND STABILITY OF STRIATIONS. K. G. Emeleus and B. Love (Queen's Univ., Belfast). pp. 289-94 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Striated columns can be classified into at least three forms: (1) very low current columns of the Holst-Oosterhuis type extending between cathode and anode; (2) striated columns with higher current density, characterized by the presence of more or less well-defined luminous discs concave to the anode, extending between the Faraday dark space and anode; and (3) columns containing more nearly symmetrical rapidly moving striations, the direction of motion being in most instances away from the anode, and the motion terminating, or at least being greatly diminished in amplitude, in the Faraday dark space. The stability and other characteristics of these types, which occur characteristically with current densities of 1 μa, 1 ma, and 1 amp/cm^2, respectively, are reviewed. 25 references. (J.S.R.)

13253

PRE-SPARKING PHENOMENA IN GASES IN UNIFORM AND NON-UNIFORM FIELDS. L. H. Fisher (New York Univ.). pp. 322-4 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A review is given of the work done at New York University on Townsend ionization coefficients and uniform field breakdown in hydrogen and nitrogen at high pressures, determination of the second Townsend coefficient in oxygen at high pressures, and the formative time lags of a positive point-to-plane corona in nitrogen and argon. (J.S.R.)

13254

SOME IDEAS ON THE GROWTH OF THE SPARK. Gordon Francis (Clarendon Lab., Oxford). pp. 332-6 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

An explanation of the mechanism of the spark in a long gap with an applied uniform electric field must describe how the ionization develops so quickly at the tip of the avalanche and how it moves forward with great speed towards the anode through a space which apparently contains no charged particles. The suggestion that the sudden increase in the ionization occurs when multiplication of electrons in the avalanche becomes large enough so that there exists at the tip a large density of excited atoms and molecules, many of which can be hit by electrons and ionized before they have time to radiate, is reviewed. To explain the rapid movement of the intense ionization towards the anode, it is assumed that when an electron hits a gas molecule and ionizes it, one of the subsequent two electrons carries away nearly all of the excess kinetic energy while the other has little speed. The fast electron moves in the usual random way, but the slow electron is pulled in the direction of the field and may move several free paths before it begins to be appreciably scattered. A numerical example for a discharge in argon is considered. Recent cloud chamber experiments seem to support this hypothesis. (J.S.R.)

13255

HIGH PRESSURE BREAKDOWN. BREAKDOWN WITH SMALL P. D. VALUES. A. C. BREAKDOWN. W. Fucks, L. Graf, G. Gurke, and H. Niesters (Univ. of Tech., Aachen). pp. 353-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The breakdown in air was studied at pressures up to 140 atm and potentials up to approximately 500 kv, and the results are given as a function of the pressure and gap length. It is shown that the breakdown field strength becomes more independent of the pressure with increasing pressure and of the gap length with increasing gap length. The results of an investigation of the breakdown of hydrogen in the region of the minimum breakdown potential are given. When a sine-shaped voltage is applied to a plane parallel gap, a rise in breakdown potential is found. However, the rise disappears when a square-wave voltage is applied. It is believed that the finite transit time of the ions causes this effect, and an experiment with iodine is described which verifies this assumption. (J.S.R.)

13256

FLASH ABSORPTION SPECTROSCOPY OF DISCHARGE PLASMAS. V. R. S. Garton and A. Rajaratnam (Imperial Coll., London). pp. 359-64 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The "line reversal" method for the determination of the temperature of hot gases has been widely applied to flames, but little used on discharge plasmas. In this method the column of hot gas emitting the line ν_0 is backed by a light source which produces a continuous spectrum so that the transmitted radiation shows either a bright or a dark line superposed on the continuum, according as the brightness temperature of the latter is lower or higher than the excitation temperature of the line. Experiments were made to modify these techniques for the determination of the temperature of a discharge plasma. Preliminary results obtained for a copper arc indicate that the technique could have wide application in plasma temperature studies. (J.S.R.)

13257

CHARGE INTERACTION IN GASEOUS DISCHARGE PLASMA. L. Goldstein (Univ. of Illinois, Urbana). pp. 399–411 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

The interaction between charged constituents of a low-pressure gaseous plasma with a relatively low degree of ionization was studied. Two aspects of the problem were considered: (1) the energy exchange between a warm gas of free electrons and a cooler gas of positive ions of equal density in relatively weakly ionized gas plasmas and (2) the energy transfer from a warm gas of free electrons to a cooler gas of free electrons in weakly ionized heavy gas plasmas. The first method of study was based on the electrical conductivity of a plasma and its variation which results from the processes investigated, and the second method, which makes use of an optical effect, was based on the volume recombination of electrons with positive ions and the variation of the probability of these recombinations with the relative velocities of the recombining charges. The comparison of the experimental values of the coefficients of heat conductivity with the theoretical values implies that heat in the plasma propagates through conduction in the electron gas of the plasma. The rate of thermal energy transfer from a warm gas of electrons to a cool gas of electrons is at least one order of magnitude higher than that involved in any other competing process. The comparison of the experimental and theoretical values of the energy relaxation times from a hot electron gas to a cooler gas of ions which are in thermal equilibrium with neutral molecules in a plasma indicates no better than fair agreement. Experiments were made in helium, neon, and xenon. (J.S.R.)

13258

RUNAWAY ELECTRONS. A. Gibson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 365–73 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

Although in a low-pressure gas discharge electrons are usually considered to be in a steady state, there are conditions under which electrons gain energy continuously. Such electrons are called runaway electrons. Two types of runaway electrons can be distinguished. There is the type in which the drift velocity remains small compared to the random velocity and the random velocity increases without limit and there is the type in which the drift velocity becomes much greater than the random velocity and the runaway electrons form a beam. The elementary theory of both types of runaway electrons is discussed, and the conditions under which each occur are obtained. Preliminary experimental work to show the relation between the two types of runaway electrons is described. The energy and intensity of runaways in hydrogen were determined. (J.S.R.)

13259

ELECTRODE IONIZATION PHENOMENA IN GASES. C. Grey Morgan (Univ. Coll. of Swansea Singleton Park, Wales). pp. 434–9 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

Investigations into electron emission processes occurring at the electrode surface in gases are described. The principle of the method used consists in the determination of the mean statistical time lag of breakdown of a spark gap comprising the electrodes and gas of interest. The experimental method and results are described. From the results and from consideration of micro and macro heating of the electrodes it was concluded that the emission takes place from sites of very small dimensions having low effective work functions by a cold field emission process in which positive ion charges at or near the surface can play an important part. (J.S.R.)

13260

THE ELECTRON ENERGY DISTRIBUTION FUNCTION IN THE HIGH FREQUENCY DISCHARGE AT HIGH CURRENT DENSITIES. L. R. Griffin and T. A. Davies (Univ. Coll. of Swansea, U. K.). pp. 440–53 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

A description is given of an experimental investigation of the electron energy distribution in pure helium and the effect of the addition of a small percentage of either argon or mercury to pure helium. The current densities were of the order of 30 ma/cm^2. The experimental results are compatible with the distribution of the electrons of higher energy being Maxwellian, the distribution depending on X/p only. At pressure less than 3 mm Hg, the addition of a small amount of impurity did not seem to affect the distribution. At higher pressures the addition produced a change and the distribution appeared to be no longer Maxwellian. (J.S.R.)

13261

STABILITY PROBLEMS OF A PLASMA. K. Hain, R. Lüst, and A. Schlüter (Max-Planck-Institut für Physik, Göttingen, Germany). pp. 458–61 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

A theoretical discussion is presented on the stability of a plasma against small perturbations and on the motion of particles in axisymmetric magnetic fields. (J.S.R.)

13262

THE INSTABILITIES OF A PINCHED TOROIDAL DISCHARGE. R. F. Hemmings, H. T. Miles, and A. A. Ware (A.E.I. Res. Lab., Aldermaston, Berks, Eng.). pp. 464–73 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

A study was made of pulsed currents in the intermediate range around 10^3 amp, using a toroidal discharge. Striations were observed during the initial stages of the discharge, and the wriggle or kink instability was seen to grow within an expanding shock wave. Photographs were also made of the discharge with pulsed toroidal magnetic fields and the fields of magnetic lenses applied to the discharge. The equipment used is described in detail, and argon was the gas used. (J.S.R.)

13263

THE ANODE DROP IN HIGH CURRENT ARCS AND LOW PRESSURE DISCHARGES. K. H. Höcker (Abteilung Reaktorphysik im Institut für Theoretische und Angewandte Physik der Technischen Hochschule Stuttgart). pp. 478–85 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11–15, 1957." Milan, Società Italiana di Fisica.

Following a short summary of the main features of the general theory of the anode drop, a discussion is given of the phenomena of the Beck discharge as representative of a high-pressure arc. The general laws of low-pressure discharge are reviewed and discussed. (J.S.R.)

13264

PHOTO-ELECTRIC LAWS AT LOW-PRESSURE DISCHARGES. W. Kluge and A. Schulz (Elektrotechnisches Institut, Technische Hochschule Stuttgart). pp. 530-3 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Exposure of the cold cathode of a highly evacuated tube to light of sufficiently short wave length induces a photoelectric current which is strictly proportional to the intensity of light. Experimental and theoretical consideration of this phenomena showed that the law of photoelectric proportionality in faultlessly built low-pressure discharge tubes shows a deviation in excess of proportionality which can be explained by the carrier kinetic theory developed by Townsend. The self-sustained discharge current is also controllable by cathode radiation. Experiments show a subproportional relationship between discharge current and radiation intensity in the glow discharge region. (J.S.R.)

13265

SOME RESULTS CONCERNING THE FLUORESCENCE OF GAS EXCITED BY HIGH ENERGY CHARGED PARTICLES. L. Koch and R. Lesueur (Centre d'Etude Nucléaires de Saclay, France). pp. 534-43 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In French)

The alpha-induced luminescence of argon, krypton, xenon, helium, and nitrogen of known purity was investigated, using a photomultiplier. The total number of photons created by a 4.7-Mev alpha particle and the duration of the luminescence are tabulated. A mixture of argon and nitrogen was also studied. The relationship of the fluorescence to the energy given the gas and the possibility of detecting heavy ions or neutrons in the presence of intense gamma radiation are discussed. 21 references. (J.S.R.)

13266

ON THE STABILIZATION OF A PINCHED PLASMA COLUMN BY AXIAL MAGNETIC FIELDS. H. L. Jordan and K. Schindler (Physikalisches Institut der Technischen Hochschule, Aachen). pp. 578-81 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The stability conditions for a pinched stationary plasma column are derived for the case of a homogeneous axial magnetic field which is completely outside of and separated from the plasma column. (J.S.R.)

13267

ANALYSIS OF CONTRACTION PROCESSES IN NEUTRALISED ELECTRON BEAMS. J. G. Linhart (C.E.R.N., Geneva). pp. 599-606 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The contraction processes in the stream of runaway electrons, which are produced by the application of an electric field to the plasma beam, are analyzed. The effect of electron-ion collisions is neglected in this study, but not the effects of electron-electron and ion-ion collisions. (J.S.R.)

13268

SOME RECENT INVESTIGATIONS ON MICRO-ARC DISCHARGES. F. Llewellyn Jones (Univ. of Wales, Swansea, Eng.). pp. 620-30 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Recent work on the initiation and characteristics of micro-arcs, such as those produced in the opening of an electrical contact, are described. Special attention is paid to the mechanism of matter transfer in the early stages of the establishment of the arc, the measurements of transfer being carried out by using a radioisotope technique. (auth)

13269

THE EMISSION OF SPECTRAL LINES OUT OF A PLASMA. W. Lochte-Holtgreven (Kiel Univ.). pp. 631-45 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The results of investigations on the effect of small perturbations in a plasma on the shape and width of spectral lines are reported. Experimental results are compared with the results predicted by the theory of perturbation by impact and by the theory of perturbation by fluctuating microfields in the plasma. (J.S.R.)

13270

THE ROLE OF IONIZING POTENTIAL SPACE WAVES IN SPARK BREAKDOWN. L. B. Loeb (Univ. of California, Berkeley). pp. 646-74 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

After a brief résumé of investigations on the mechanisms in gas breakdown, the glow-to-arc transitions below the millimeter pressure range for pure nitrogen, argon, oxygen, hydrogen, and mixtures of oxygen and nitrogen are described. The results of investigations on the spark breakdown process very near threshold for asymmetrical gaps ranging from needle point to plane to 31 cm diameter spheres to plane gaps and ranging from 1 to 9 cm in length in room atmosphere are also reported. 32 references. (J.S.R.)

13271

THE VARIATION OF ELECTRON DENSITY IN THE EARLY AFTERGLOW OF PULSED GAS DISCHARGES. P. D. Lomer (Services Electronics Research Lab., Baldock Herts). pp. 675-82 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Some results of microwave measurements of electron density decay in the early afterglow of pulsed r-f discharges are described. These results were obtained in the course of studies of new forms of microwave pulsed attenuators. The pulsed discharges are produced in silica tubes, with external electrodes. The applied field was at a frequency of about 30 Mc/s and the pulse length about 4 μsec. The gases studied were the rare gases and nitrogen at pressures from 5 mm of Hg up to 60 mm of Hg. Electron densities up to $4 \times 10^{12}/cm^3$ were measured. (auth)

13272

GENERAL DESCRIPTION OF STATIONARY ARC DISCHARGES WITH SOME EXPERIMENTAL APPLICATIONS. H. Maecker (Research Laboratory of the Siemens-Schuckertwerke Erlangen). pp. 684-94 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Equations describing arc discharges are derived from the theory of the thermodynamics of irreversible processes. The cylindrical arc, free low current arc, and free high current arc are discussed, and experi-

mental studies are described. In the case of the cylindrical arc there exists a power supply by the electric field and an energy dissipation by the heat conduction only. In the free low current arc the convection flow caused by the buoyancy acts as the tube walls. In the free high current arc the high current density near the cathode spot and the strong intrinsic magnetic field cause a local compression which accelerates the plasma. This plasma stream predominates the entire behavior of the arc and produces its typical character with its high stability and high temperature. (J.S.R.)

13273

INVESTIGATIONS OF SPARK DISCHARGE. S. Mandelstam (Academy of Sciences, Moscow). pp. 695-706 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In German)

The investigations on spark discharge carried out in the Physical Institute of the Academy of Sciences of the USSR are described. The mechanism of the arc buildup, excitation of the spectrum, and electrode phenomena are discussed. A hydrodynamic theory of the spark is presented. All the work was done with short sparks at atmospheric pressure. (J.S.R.)

13274

RECENT EXPERIMENTS ON EXPLODING WIRES AND HIGH DENSITY PLASMAS. Marcus O'Day, William G. Chace, and Edmund H. Cullington (Air Force Cambridge Research Center, Geophysics Research Directorate, Mass.). pp. 784-807 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A mechanism of the exploding wire phenomenon has been presented. It is proposed that the metal is heated above its boiling point before any significant change occurs. Not until the liquid is strongly superheated does vaporization occur and then as a transplosion, an explosive change of phase. The change from liquid metal to metal vapor is accompanied by a change from metallic conduction to gaseous conduction. Carriers in this gas are few and not self-sustaining, hence the current falls from several tens or hundreds of kiloamperes to something under 100 amperes. The extremely rapid formation of vapor has resulted in a very high pressure. This pressure is high enough to prevent breakdown. However, the gas is contained only by the atmosphere, hence expansion begins immediately and within a few microseconds the pressure has fallen to a pressure at which breakdown may occur and an arc is formed. Now of course ionization by impact produces ample carriers and the current rises until restricted by the associated circuit resistance. This same mechanism, with appropriate changes in the conditions, accounts for those cases where a wire explosion produces single pulses or a notched sine wave. A series of experiments on exploding wires is described. (auth)

13275

A POSSIBLE MECHANISM OF PARTICLE ACCELERATION IN HIGH CURRENT SPARK DISCHARGES. Shigeo Nagao (Tohoku Univ., Sendai, Japan). pp. 736-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A quantitative examination is made of a possible mechanism for particle acceleration in contracted plasma. It is concluded that in the gap space of high current spark discharge an electromagnetic field like that in a cylindrical cavity is excited by discharging current. (J.S.R.)

13276

PROPERTIES OF THE PLASMA DETERMINED BY LANGMUIR PROBE MEASUREMENTS IN LOW-PRESSURE MERCURY ARCS. Wayne B. Nottingham (Massachusetts Inst. of Tech., Cambridge). pp. 756-83 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

New methods are shown for the analysis of Langmuir probe data. Not only have the methods been explained, but the results are illustrated by relating the equations to the best experimental data available at present. The efficiency of the process by which excited atoms of mercury are converted into positive ions is discussed. It is proposed that this high efficiency results from the formation of an excited mercury molecule which is then ionized and dissociated. (J.S.R.)

13277

OBSERVATIONS ON THE IONIZING RADIATION EMITTED BY SHORT-DURATION SPARKS. W. A. Prowse and G. R. Bainbridge (Durham Univ., Eng.). pp. 851-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Photoionization in a gas was studied by examining how much the radiation from one spark gap facilitates sparking in a neighboring gap. The absorption and the time effects of photoionizing radiation were studied. It was shown that the spark in the short overvolted irradiator gap emits radiation capable of ionizing the gas in which the spark is produced. Photographic observations indicate that the action of the ionizing radiation is not confined to the production of a casual electron to start the discharge, but for a measurable time continues to contribute to the development of conduction processes in the test gap. If a short spark gap is stressed to the threshold of breakdown, then a very large number of casual electrons can appear in the gap before favorable conditions lead to actual breakdown. (J.S.R.)

13278

SECONDARY MECHANISMS OF THE GLOW DISCHARGE. D. J. Rose (Bell Telephone Labs., Murray Hill, N. J.). pp. 888-902 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Experiments on secondary emission coefficients in hydrogen and deuterium are reported. Values of the quantity γ_i, secondary electrons per incident positive ion, were determined. In addition an approximate measurement was made of the effect of photons in maintaining glow discharges in hydrogen or neon. Preliminary results of these measurements are given. (J.S.R.)

13279

A HEATING MECHANISM FOR A PLASMA. A. Schlüter (Max-Planck-Institut für Physik, Göttingen, Germany). pp. 924-7 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A possible heating mechanism for a plasma in which the variation of a magnetic field is used to increase the total energy of the plasma is discussed. (J.S.R.)

13280

ELECTRIC SPACE CHARGE DOUBLE LAYERS IN LOW PRESSURE DISCHARGES. M. J. Schönhuber (Elektrophysikalisches Institut der Technischen Hochschule, München). pp. 930-63 in "Terzo Congresso

Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Studies of low-pressure discharges along the axis of a tube with a mercury pool cathode by means of Langmuir probe measurements are reported. The variable parameters were the pressure of the mercury vapor, the discharge current, and the tube geometry. (J.S.R.)

13281

HIGH PRESSURE DISCHARGES IN GAS MIXTURES. P. Schulz (Techn. Hochschule, Karlsruhe). pp. 973-88 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Investigations were made on discharges in heavy inert gases mixed with helium or hydrogen. The discharges were made in a cylindrical quartz tube with tungsten electrodes with a distance between them of 6.5 cm. The variations of the potential drop, luminous intensity, and luminous flux with different partial pressures of helium and hydrogen in argon, krypton, and xenon were determined. Discharge phenomena in argon, krypton, or xenon mixed with mercury vapor are also reported. (J.S.R.)

13282

WAVE PROPAGATION IN PLASMAS. W. O. Schumann (Elektrophysikalisches Institut, Munchen). pp. 989 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The laws of propagation for electric waves in bounded plasmas were studied by using a "plasmacable." This is a normal cable with the inner conductor being a thin tube of glass filled with the positive column of a discharge. If the refraction index of the plasma is known, then the wavelength, the characteristic impedance, and the attenuation can be calculated. Experimental results agree favorably with theory. The wave propagation for plasma surrounded by air is given. The plasma of the ionosphere was studied by observing atmospherics at very low frequencies. (J.S.R.)

13283

EXPERIMENTAL STUDIES ON THE MECHANISM OF ELECTRIC SPARK DISCHARGE. Ukichi Shinohara (Nagoya Univ., Japan). pp. 998-1017 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Spark discharges by impulse and d-c voltages were studied. The growth of spark discharge in air by impulse voltage, d-c spark discharge in air, and the conditions of spark breakdown are discussed in detail. It was concluded that in the initial stage of spark discharge, ionization produced by collisions of casual electrons in the atmosphere plays an important role. The buildup of a space charge field within the gap depends on the ion density and its distribution in the gap. Electron avalanches from the cathode in the space charge field are essential to spark breakdown. Positive ions are necessary in the gap to form a conductive path. For spark breakdown a space charge field with an ion density as high as 10^8 ions/cm^3 in the gap and the passage of an electron avalanche from the cathode are necessary. The uniformity of ion distribution in the direction perpendicular to the axis of the electrodes determines whether the spark discharge is of the streamer form. The difference between the appearance and character of vacuum discharge and air discharge depends on the mean free path of the electrons in the residual gas and the distance between electrodes as the mechanisms in vacuum and air are essentially the same. (J.S.R.)

13284

ABOUT THE STAR-LIKE FUSION-REACTOR. K. Simonyi and M. Uzsoky (Central Research Inst. of the Hungarian Academy, Budapest). pp. 1036-49 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A quantitative treatment is given of the parameters necessary for a steady energy production in DT gas at constant pressure confined in a spherical container having a wall of high temperature. The calculations are based on a consideration of the plasma as an isobar DT star. (J.S.R.)

13285

THE INFLUENCE OF AN AXIAL MAGNETIC FIELD ON THE STABILITY OF A CONSTRICTED GAS DISCHARGE. R. J. Tayler (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 1067-78 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A brief account is presented of the influence of axial magnetic fields and fields due to eddy currents in highly conducting tube walls on the stability of a constricted gas discharge. Two configurations were studied in detail: in the first the plasma current is carried on its surface, and in the second the axial current is uniformly distributed across the discharge. Equations were also obtained for the more general case when the axial current and magnetic field in the plasma have completely general radial distributions. (J.S.R.)

13286

STAGES OF IMPULSE BREAKDOWN. J. Karl Theobald (Los Alamos Scientific Lab., N. Mex.). pp. 1093-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

An investigation of the properties of over-volted impulse breakdown indicates that by the use of pulse power and length of driving cable as parameters in addition to the ordinary discharge parameters of gap geometry and gas pressure, the spark-to-arc transition may be followed in detail. Graphs showing the effect of these parameters on the discharge are given. (J.S.R.)

13287

THE DEVELOPMENT OF THE CONSTRICTED DISCHARGE. W. B. Thompson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). pp. 1099-1104 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The structure of the low-current arc and the high-current arc are given briefly. The transition from the low- to the high-current state is then described by an approximate calculation of the discharge characteristics. (J.S.R.)

13288

PROBE MEASUREMENT OF ELECTRON TEMPERATURE IN THE POSITIVE COLUMN OF A RARE GAS DISCHARGE AND CORRELATION WITH MICROWAVE NOISE. W. Verweij (N. V. Philips' Gloeilampenfabrieken, Eindhoven). pp. 1115-30 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Societa Italiana di Fisica.

Probe measurements of the electron temperature in the positive column of rare gas discharges at a gas pressure of 10 mm of Hg and a current density of 400 ma/cm^2 are described. A tungsten probe of 20 μ diameter is used. The characteristics are measured with a torsion string galvanometer, each point being measured approximately 0.02 sec after the probe has been heated to the highest temperature it attains in the series of measurements. Subsequently, the work function of the probe is always the same as that of the probe in equilibrium with the ambient gas at the heating temperature. The results are in good agreement with the results of microwave noise measurements. The changes in the work function of the probe are investigated as a function of the temperature in rare gas and in an argon–mercury discharge. The results show that the characteristics which are recorded differently from the manner described are unsuitable for interpretation. (auth)

Electrons

13289

POLARISATION EFFECTS IN ELASTIC SCATTERING OF DIRAC ELECTRONS BY SCREENED COULOMB FIELD. Haridas Banerjee (Indian Inst. of Tech., Kharagpur). Acta Phys. Austriaca 12, 70-83(1958).

Polarization dependent cross section for scattering of Dirac electrons by a screened Coulomb field was calculated in the covariant S-matrix formalism. The first contribution to the asymmetry factor a(θ) appears only in the second Born approximation of the external field. The effect of screening was found to be small except at small angle and low energy scattering. Detailed analyses of the results were given for three cases, when the incident beam is (a) unpolarized, (b) longitudinally polarized, and (c) transversely polarized. Applications to double and triple scattering experiments were considered and expressions for the asymmetry ratio δ were obtained for these cases. Results of recent double scattering experiments with longitudinally polarized electron beam were found to compare favorably with the theoretical results obtained. (auth)

13290

DISCRETE ENERGY LOSSES OF ELECTRONS IN Mg, MgO, BeO AND Ge. N. B. Gornyi. Izvest. Akad. Nauk S.S.S.R. Ser Fiz. 22, 475-85(1958) May. (In Russian)

Parallel studies of discrete energy losses in reflection of electrons with comparatively small energies (~100v) and discrete groups of truly-secondary electrons of Mg, MgO, BeO, and Ge indicate that the discrete losses are conditioned by interzonal transitions. With the energy increase in falling electrons, the probability of discrete losses in high energies also increases. Discrete losses with very small energies (for Mg–3 ev, MgO–5 ev, BeO–4 ev, and Ge–2 ev) were found, however, these losses were obviously conditioned by a different mechanism. (R.V.J.)

13291

A VARIATIONAL PRINCIPLE AND AN ENERGY THEOREM FOR SMALL-AMPLITUDE DISTURBANCES OF ELECTRON BEAMS AND OF ELECTRON-ION PLASMAS. P. A. Sturrock (Stanford Univ., Calif.). Ann. Phys. (N. Y.) 4, 306-24(1958) July.

Small-amplitude disturbances of electron beam and electromagnetic field configurations may be conveniently represented by the electromagnetic potentials of the field perturbation and the displacement vector representing the perturbation of the electron assembly. With this choice of dynamical variables, it is possible to establish a Lagrangian function for small-amplitude disturbances, in which both field and particles are described by "field-like" variables. This derivation is carried through in relativistically covariant form. It is shown that, by a variant of a formula due to Schrödinger, an acceptable formula may be established for the energy-momentum tensor of the field-particle assembly. The more important formulas are given also in non-relativistic three-dimensional form. The differential equation satisfied by the energy-momentum tensor represents a generalization of the so-called "power theorem" of electron-tube theory. It is anticipated that this variational principle, which may be readily extended to include a number of beams, or a distribution of electron velocities, will provide a convenient basis for certain electron-tube analyses, and for the investigation of certain stability problems in plasma physics. (auth)

Gases

13292 AEC-tr-3303

THE LAWS OF MOLECULAR AND VISCOUS FLOW OF GASES THROUGH TUBES. (Die Gesetze der Molekularströmung und der inneran Reibungsströmung der Gase durch Röhren.) Martin Knudsen. Translated by Lydia Venters (Argonne National Lab.) from Ann. Physik, (4), 28, 75-130(1909). 34p.

Experimental data from studies of the flow of H_2, O_2, and CO_2 through glass capillary tubes were collected and treated to determine the effect of tube dimensions and physical properties of the gases on molecular flow. Laws governing the transition from viscous to molecular flow were also sought. (T.R.H.)

13293

MOBILITY OF GASEOUS IONS IN WEAK ELECTRIC FIELDS. Edward A. Mason and Homer W. Schamp, Jr. (Univ. of Maryland, College Park). Ann. Phys. (N. Y.) 4, 233-70(1958) July.

Kihara's extension of the Chapman-Enskog theory of transport phenomena is used to obtain the second order and third order approximations to the mobility of gaseous ions in a weak electric field as a function of temperature and field strength. In this method it is assumed that there is no charge exchange between ions and molecules, there is no clustering, and that quantum effects can be neglected. The mobility is expressed as a series in ascending powers of the square of the field strength with coefficients which are complicated functions of the temperature, the mass ratio of the ions and molecules, and of the force law between the ions and molecules. The collision integrals which enter into the coefficients have been evaluated by numerical integration for a force law which takes into account the charge-induced dipole, charge-induced quadrupole, and the London dispersion forces, and an inverse twelfth power repulsion potential. In the potential energy function three disposable parameters specify the depth and position of the minimum, and the relative magnitudes of various terms. The results of the present calculation are then used to analyze published experimental data on mobility to obtain the disposable parameters which determine the ion-molecule force law. The agreement between theory and experiment is good except for those cases in which clustering is to be expected. (auth)

13294

THE IONIZATION OF FAST NEUTRAL POTASSIUM ATOMS ON COLLISIONS WITH ARGON ATOMS AND WITH MOLECULES OF HYDROGEN, NITROGEN, AND

OXYGEN. Yu. F. Bydin and A. M. Bukhteev (Physico-Tech. Inst. Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 119, 1131-3(1958) Apr. 21. (In Russian)

Ionization of fast potassium atoms with energies of 100 to 2000 in an impact with argon atoms and molecules of hydrogen, nitrogen, and oxygen was studied. The scheme of the experimental apparatus is described. Measurements of effective cross sections Q in relation to the energy T and atomic velocity v are plotted. In the energy interval of 100 to 2000 ev the effective cross sections for fast potassium atoms are 10^{-15} to 10^{-17} cm^2, they increase with the increase of T. The magnitude of the effect increases with the transition from argon to molecular gases and from hydrogen to heavier gases. (R.V.J.)

13295

CALCULATION OF VIRIAL AND JOULE-THOMSON COEFFICIENTS AT EXTREMELY HIGH TEMPERATURES. Edward A. Mason and Joseph T. Vanderslice (Univ. of Maryland, College Park). Ind. Eng. Chem. 50, 1033-5(1958) July.

Direct experimental measurements of gases at elevated temperatures cannot usually be made, and extrapolation from measurements at low temperatures may yield erroneous results; however, reliable results can be calculated if precise intermolecular force information is available. Approximations for the second and third virial coefficients for cases where the interaction energy is represented by an exponential are presented. By means of these parameters, the second and third virial coefficients have been calculated at high temperature for helium, neon, and argon and compared with available experimental data. Any thermodynamic properties which depend on equation of state data can then be obtained from standard thermodynamic relations. (J.R.D.)

13296

THE METHOD OF PROPER FUNCTIONS FOR THE STUDY OF VELOCITY DISTRIBUTION FUNCTIONS IN IONIZED GAS. Arsac, M. Bayet, Coste, J. Delcroix, J. Denisse, Salmon (Ecole Normale Supérieure, Paris). pp. 92-5 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Societa Italiana di Fisica. (In French)

A study is made of the form which the electron velocity distribution function takes in an ionized gas under the combined action of an electric field and elastic collisions between electrons and molecules. The method described applies essentially to gases only slightly ionized and heated and in which it is the interaction between electrons and neutral molecules which limits the heating of the electrons. (J.S.R.)

Instruments

13297 ORNL-2480

Oak Ridge National Lab., Tenn.

INSTRUMENTATION AND CONTROLS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING JULY 1, 1957. 126p. Contract W-7405-eng-26. $2.75 (OTS).

The circuitry and performance characteristics are given for a pulse crossover pickoff gate for use with a medium-speed coincidence circuit. An experimental digital count-rate meter was built which has the analog output characteristics of a rate meter and the counting mechanism of a scaler. A study was made of the grid currents in commercially available receiving and amplifying tubes. The study was limited to grid currents exceeding 10^{-13} amp, plate voltages between 20 and 300 v, and cathode currents between 50 μa and 100 ma. Tests were conducted to determine the intrinsic stability of neon-filled voltage reference tubes. Internal impedance and drift rate are given for a number of tube types. A neutron-chopper speed-control system for use with the time-of-flight spectrometer is being developed. A block diagram of the system is given. The main features of a 256-channel neutron time-of-flight spectrometer installed at the Low Intensity Test Reactor are given. Instrumentation for the ORNL Graphite Reactor pile oscillator was redesigned for greater speed and accuracy. A block diagram is given along with preliminary performance data. A block diagram, photographs, and the performance characteristics are given for an 18-channel time-base analyzer developed to study the time-dependent behavior of neutrons in a moderator. Progress in the development of a position indicator for the single-crystal spectrometer being installed in the Bulk Shielding Facility is reviewed. Modifications made in an existing electron-spin resonance spectrometer to convert it to a superheterodyne electron-spin resonance spectrometer are described. A new input-output system, superior in versatility, reliability, and speed, was installed at the ORACLE. Developmental work on a small, high-efficiency scintillation Geiger counter is described. Three variations of the standard method for preparing zinc sulfide phosphors are discussed. The design and operation of a scanning device developed for scanning activated materials from flux distribution experiments is described. Additional work is reported on the development of instrumentation for radiochemical laboratories, powder metallurgy laboratories, the Thorex Process, a volatility separation process, uranyl sulfate fuel processing, and homogeneous reactor control. Specific pieces of equipment developed and described include a resin-bed displacement meter, a slurry pump, a falling-ball viscometer, a capillary viscometer, liquid-level indicators, pressure transmitters, a flow transmitter, a gamma ionization chamber, an oxygen injection system, valves and valve actuators, a magnetic flowmeter, and thermocouples. (For preceding period see ORNL-2234.) (D.E.B.)

13298 SCL-T-170

A DIFFUSION HYDROMETER WITH DIRECT READING (Diffusionshygrometer mit direktor Ablesung). H. Greinacher. Translated by M. I. Weinreich (Sandia Corp.) from Schweiz. Arch. angew. Wiss. u. Tech. 20 198-200(1954). 6p.

A diffusion hygrometer is designed with a rotating adjustment device for the purpose of determining relative humidity by a direct reading. (J.E.D.)

13299 SCL-T-186

ELECTRICAL MEASUREMENTS ON ELECTRO-INSULATING MATERIALS. (Uber Elektrische Messungen an Elektroisolierstoffen.) E. Rüiker. Translated by M. I. Weinreich from Deut. Electrotech. 10, 286-90(1956). 21p.

The measurement of electrical properties of insulating materials is discussed. The mathematical treatment of such values is also discussed. (T.R.H.)

13300

A NEW PHOTOMULTIPLIER FOR SCINTILLATION COUNTERS. A. G. Berkovskii. Atomnaya Energ. 4, 466-8(1958) May. (In Russian)

Descriptions are given of the design and performance of a new photo-electron multiplier. (R.V.J.)

13301
TRANSISTOR CHOPPER DRIVES ACCURATE CLOCK. Richard H. Williams (Sandia Corp., Albuquerque, N. Mex.). Electronics 2p.(1958) May 23.

A transistorized control circuit including a frequency-determining crystal oscillator feeds a voltage chopper which doubles the 28-v d-c supply and divides the driving frequency is described. The a-c pulsed output then drives a synchronous clock motor. The system measures time intervals from 10 sec to minutes with an accuracy of 0.02 percent over a temperature range from –55 to +70 C. (auth)

13302
INCREASING THE SELECTION COEFFICIENT OF MIXERS WITH COMMON LOAD IN HIGH SPEED COINCIDENCE CIRCUITS. Ye. B. Usha. Nekotorye Voprosy Priklad. Elektron. 66-8(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8562.)

The selection coefficient ζ of mixers with common load in high speed coincidence counters is calculated. (ζ is the ratio $\Delta V_n / \Delta V_{n-1}$, where ΔV_n is the amplitude at the output of the mixer corresponding to simultaneous application of signal to all n inputs of the coincidence circuit, and ΔV_{n-1} is the same for the application of a signal to n-1 inputs). It is indicated that in ordinary coincidence circuits with $\tau_{res} \sim 10^{-9}$ to 10^{-8} seconds, ζ is small and can be expressed approximately by the formula $\zeta \approx n/(n-1)$. A mixer circuit for double coincidence, in which the common anode load of the mixer is shunted by a diode to increase ζ, is described. The use of the diode permits a considerable increase in ζ.

13303
THE USE OF THE ALPHA-IONIZATION MANOMETER IN SORPTION STUDIES. M. M. Dubinin, K. M. Nikolaev, and A. I. Sarakhov (Inst. of Physical Chemistry, Moscow). Zhur. Fiz. Khim. 32, 1155-9(1958) May. (In Russian)

A modification of the alpha-ionization manometer developed permits pressure measurements to be made over the range 1.10^{-2} to 150 mm Hg, with an accuracy close to and in some regions higher than for the mercury manometer. The manometer may be used in determining adsorption isotherms and in a number of other physico-chemical investigations. The size of the ionization chamber and the shape of the collector electrode depends upon the region of the pressure measured. Therefore for manometers intended for use over a broad pressure range (1.10^{-4} to 1000 mm Hg) it is feasible to have two ionization chambers, one for high and the other for low pressures. (tr-auth)

13304
TRIGGER TUBES FOR SWITCHING AT MEGACYCLE SPEEDS. A. H. Beck and T. M. Jackson (Standard Telecommunication Lab., Ltd., Enfield, Middlesex). pp. 96-100 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

A schematic is given of the switching circuit for use at megacycle speeds. Either diodes or triodes with cathodes of pure Mo or Ni and internal sources of priming electrons may be used in the circuit. The glow initiation and the geometry in the operation in the simplest diode case are discussed. (J.S.R.)

Isotopes

13305
ON THE MEASUREMENT OF ISOTOPE ABUNDANCE OF LITHIUM WITH MASS SPECTROMETER. Itiro Omura and Nozomu Morito (Hitachi Central Research Lab., Kokubunji, Tokyo). J. Phys. Soc. Japan 13, 659 (1958) June.

The values of the isotope abundance ratio Li^7/Li^6 obtained were 12.48 ± 0.05 and 13.69 ± 0.05 for two samples of lithium chloride. (W.D.M.)

13306
TABLE OF ISOTOPES. D. Strominger, J. M. Hollander, and G. T. Seaborg (Univ. of California, Berkeley). Revs. Modern Phys. 30, No. 2, Pt. II, 585-904(1958) Apr.

A table is presented of a complete list of the radioactive and stable isotopes, with a number of their salient features, as recorded in the literature or by private communications up to February 1958. (W.D.M.)

Isotope Separation

13307
ENRICHMENT OF URANIUM ISOTOPES BY THE GAS CENTRIFUGE PROCESS. W. Groth (Universität Bonn). Nukleonik 1, 68-73(1958) July. (In German)

A survey is presented on the enrichment of uranium isotopes by gas centrifuge processes. Emphasis was placed on the studies performed in Germany since 1941. 27 references. (J.S.R.)

Mass Spectrography

13308
SECONDARY PROCESSES IN MASS SPECTROMETRY. M. Ackermann, J. Drowart, P. Goldfinger, and M. Jeunehomme (Université Libre de Bruxelles). pp. 1-18 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In French)

In the analysis of gaseous mixtures by mass spectroscopy, the minimum partial pressure that can be detected with the conventional mass spectrometer is of the order of $\approx 10^{-10}$ mm Hg. The possibility was studied of increasing the total pressure in the source to $\approx 10^{-4}$ mm Hg. Ar, Kr, and methane were used in the source. During these experiments a series of secondary phenomena was observed. A reaction $Ga^{2+} + R \rightarrow Ga^{+} + R^{+}$ was interpreted as the partial discharge of ions caused by collisions with molecules of the residual gas in the tube. An estimation of the yield of this reaction is given. Induced dissociation of molecular ions was also observed in the tube. With argon in the ion source the reactions $Ar^0 + Ar \rightarrow Ar_2^+ + e$, $Ar^0 + e \rightarrow Ar^{2+} + 3e$, and $Ar^0 + Ar^0 \rightarrow Ar^+ + Ar + e$ were observed. The dependence of these reactions on the ionic current, the pressure, and the electronic current is discussed. The mass spectrometer used was of the usual type, but between the ion source and the separating tube a copper plate with an entry for the ions was placed. (J.S.R.)

Mathematics

Refer also to abstract 13446.

13309 APEX-376
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
MONTE CARLO RESEARCH SERIES: GAMMA HEATING STUDY NO. 1: GAMMA HEATING RATE DENSITY

RADIAL VARIATION IN A CORE CELL FOR THREE FUEL CYLINDER SPACINGS. J. R. Beeler, Jr., R. H. Nelson, and R. G. Herrmann. Oct. 15, 1957. 14p. (XDC-57-11-91). $3.30(ph OTS); $2.40(mf OTS).

A hypothetical reactor core is presented in which right cylindrical fuel regions are positioned at the core corners of equilateral, space-filling, parallelograms. The average gamma heating rate density in each of a set of concentric annular regions, centered on a fuel cylinder, is presented for three different fuel cylinder separation distances. The fuel cylinder radius, fuel composition, and moderator composition are held constant. The calculation was done using the Monte Carlo method. (auth)

13310 APEX-392

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

MONTE CARLO RESEARCH SERIES: PROGRAM FOR COMPUTING THE GAMMA HEATING DISTRIBUTION IN THE HEXAGONAL GENERATING CELL OF AN INFINITE HETEROGENEOUS REACTOR. R. G. Herrmann, J. R. Beeler, and R. H. Nelson. June 27, 1958. 39p. (XDC-58-7-19). $6.30(ph OTS); $3.00 (mf OTS).

A detailed description is given of a Monte Carlo method and the accompanying IBM 704 program for the determination of the gamma energy loss distribution in the central cell of a proposed infinitely long heterogeneous reactor. (auth)

13311 APEX-396

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

SHIELDING COMPUTER PROGRAM 04-0, REACTOR SHIELD ANALYSIS. W. E. Edwards, J. E. MacDonald, B. Goldberg, and K. Paine. May 1, 1958. 69p. (XDC-58-7-76). $10.80(ph OTS); $3.90(mf OTS).

Shielding Computer Program 04-0 is available for computing reactor-shield weight and fast neutron and gamma ray dose rates in and around complex reactor-shield assemblies. Reactor and shield geometries are described by combinations of regions formed by rotating rectangles or trapezoids about the reactor axis or by translating rectangles parallel to the reactor axis. Compositions are expressed as volume fractions for each material in the reactor-shield assembly. A cylindrical coordinate system is used to describe the location and dimensions of a volume source. Source distributions are assumed separable and may be described by cosine functions. A modification of the Albert-Welton theory of neutron attenuation is used for fast neutron dose rate calculations. Combination of buildup factors is used with exponential attenuation to compute gamma ray dose rates. The program requires four magnetic tape units and two frames of magnetic core memory on an IBM 704. Magnetic drum memory is not required. (auth)

13312 GAT-DM-695

Goodyear Atomic Corp., Portsmouth, Ohio.

IBM-650 PROGRAM FOR DOUBLE-PRECISION LEAST SQUARES FIT. D. L. Thomas. July 24, 1958. 5p. Contract [AT(33-2)-1]. $1.80(ph OTS); $1.80(mf OTS).

A computer program is presented for fitting any one of five different curves to data. As many as one hundred and forty-nine observations, each containing as many as eight digits, can be handled by this program. (W.L.H.)

13313 LA-2196

Los Alamos Scientific Lab., N. Mex.

THE DIFFUSION OF RADIATION. Francis H. Harlow and Billy D. Meixner. Apr. 1958. 46p. Contract W-7405-eng-36. $1.25(OTS).

The diffusion approximation, a simplified formulation of the equations of radiation transport, is investigated from two points of view. First, consideration is given to derivation of the approximation, together with discussion of some of the assumptions involved and limitations of validity. Second, methods are examined for solving the diffusion equation by finite difference approximations. In this second part, particular attention is given to the problem of proper space differencing, and numerical examples are presented showing results of various procedures. (auth)

13314 ORNL-2534

Oak Ridge National Lab., Tenn.

A COMPUTER FOR A POSITION INDICATING SYSTEM (thesis). D. J. Knowles. Aug. 7, 1958. 85p. Contract W-7405-eng-26. $2.25(OTS).

Submitted to the Univ. of Tenn.

The design and construction of a computer which would compute the space coördinates of a given point on a massive spectrometer housing, using the linear measurements of another point on the apparatus and angular information as inputs and solving three linear equations involving trigonometric functions, are presented. This computer is part of a larger system for indicating the coördinates of the interesting point, and the over-all project controlled the derivation of the equations which the computer solves as well as the type of readont used. (W.L.H.)

13315 RPI-9(AECL)

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.

AN IMPROVED CONTROL BOARD FOR CARD-PROGRAMMING. THE IBM 602A CALCULATING PUNCH. L. Pease. June 1955. Reissued June 1956. 36p. (AECL-317). $1.00(AECL).

Some general comment on the advantages of automatic calculations using punched cards is offered and an improved version of a general purpose 602A control board is described in detail. This is the first such control board to be used at Chalk River, and although operating experience with it is limited, it does provide a convenient means of processing many calculations which have until now been done by desk machine or, worse still, not at all. (auth)

13316 SCR-20

Sandia Corp., Albuquerque, N. Mex.

A COMPARISON OF THE POWER CURVES OF SOME DOUBLE-SAMPLE TESTS. Donald B. Owen. June 1958. 7p. Contract AT(29-1)-789. $1.80(ph OTS); $1.80(mf OTS).

A comparison is given of the power curves for known standard deviation double-sample tests with equated expected sample sizes. (W.L.H.)

13317 SCTM-177-58(15)

Sandia Corp., Albuquerque, N. Mex.

AN APPLICATION OF THE TRINOMIAL DISTRIBUTION TO ACCEPTANCE INSPECTION. Berton E. Barker. June 3, 1958. 14p. Contract AT(29-1)-789. $3.30 (ph OTS); $2.40(mf OTS).

In acceptance inspections by attributes, it is often possible and sometimes desirable to group material into three categories: "defective," "substandard," and "nondefective," rather than into the usual binomial categories: "defective" and "nondefective." In the acceptance plan proposed, based on the trinomial distribution, the proportion "defective" is controlled,

as well as the proportion "defective" plus "substandard." It is also shown that the operating characteristic function can be defined by the operating characteristic curves of two binomial plans. (auth)

13318 APEX-372

ON THE APPLICATION OF THE METHOD OF B. G. GALERKIN TO LINEAR PROBLEMS ARISING FROM DYNAMICAL SYSTEMS WITH DISTRIBUTED PARAMETERS. S. G. Gurevich. Translated by James F. Heyda (General Electric Co. ANP Dept., Cincinnati) from Inzhenernyi Sbornik 22, 48-52(1955). 10p. (XDC-58-3-169).

Galerkin's method is applied to the solution of a linear partial differential equation of arbitrary order under specified initial and boundary conditions. An example is carried through in complete detail to illustrate the method. (auth)

13319

THE SOLUTION OF THE BOLTZMANN EQUATION BY ASSUMING A CONSTANT RELAXATION TIME. Z. Bodo (Research Inst. for Telecommunication, Budapest). Acta Phys. Acad. Sci. Hung. 8, 177-9(1957).

An exact solution is given of the Boltzmann equation for electrons following the Maxwell-Boltzmann distribution in a homogeneous electrical field and in the case of constant relaxation time. Ohm's law and Joule's law can be immediately obtained from the solution. (auth)

13320

STABILITY AND CONVERGENCE LIMITATIONS ON THE USE OF ANALOGUE COMPUTERS WITH RESISTANCE NETWORK ANALOGUES. M. E. Fisher (King's Coll., London). Brit. J. Appl. Phys. 9, 288-91(1958) July.

Various practical methods have been described for solving partial differential equations such as $\nabla^2\phi = f(\phi)$ by means of resistance networks coupled to electronic analog computing units. These schemes are investigated mathematically to determine the conditions for which the computer remains stable, or for which the successive approximations converge to the required solution. It is shown that all the methods will break down if the gradient $df/d\phi$ is negative and sufficiently large to cause the correct solution to be "wave-like." (auth)

13321

DIRAC MATRICES IN RIEMANNIAN SPACE. J. G. Fletcher (Princeton Univ., N. J.). Nuovo cimento (10) 8, 451-8(1958) May 1.

An explicit formula is developed for the affine spinor connection, Γ_i, in an arbitrary spin representation. This formula makes it possible explicitly to write the Dirac equation in Riemannian space, $\gamma^i(\Psi_i - \Gamma_i\Psi) + m\Psi = 0$, in a form which may be subjected to arbitrary similarity transformations. Also, some useful algebraic properties of Dirac matrices are developed. (auth)

13322

CAUSALITY CONDITION AND SPECTRAL REPRESENTATIONS OF THE GREEN'S FUNCTIONS. V. N. Gribov (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1310-18(1958) May. (In Russian)

Spectral representations of the mean vacuum T products of three Heisenberg operators were obtained with the aid of the causality condition in the form of the requirement of commutivity of the field operators on a space-like surface. The analytical properties of these functions in the complex plane are considered. (tr-auth)

Measuring Instruments and Techniques

13323 AERE-Med/R-2587

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE ALPHA COUNTING OF A THICK FILM WITH A PULSE AMPLITUDE ANALYSER — TYPE 1414A. W. P. Hutchinson. May 1958. 11p. $0.32(BIS).

Owing to difficulties in producing thin counting films by the standard PuF_3 precipitation procedure an attempt was made, with some success, to identify alpha emitting elements using thick films produced by routine analytical techniques. (auth)

13324 REIC-6

Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.

A SURVEY OF CURRENT RESEARCH AND DEVELOPMENTS IN THE FIELD OF DOSIMETRY. M. J. Oestmann, J. F. Kircher, and P. Schall, Jr. May 31, 1958. 45p. Project No. 2133. Contract AF33(616)-5171. (AD-157172).

A survey of current practices used in high-level dosimetry of gamma, neutron, and mixed fields is presented. Chemical and colorimetric systems including ferrous-ferric, ceric-cerous, gas evolution, nitrous oxide, various dyes, and polymers have been considered. Silver-activated phosphate and other glasses are discussed. Ionization chambers for either gamma ray or neutron measurements have been commonly employed at very high dose rates and several designs are discussed. Luminors such as anthracene and naphthalene, and semiconductors such as germanium have also found application at high radiation doses. Different designs of calorimeters have been used for measuring energy absorbed, but only to a limited extent. Neutron spectra ranging from thermal through resonance to fast neutrons can best be determined by activation of appropriate materials having desirable nuclear properties. An extensive bibliography is provided for those interested in further details on any particular system. (auth)

13325 USNRDL-TR-244

Naval Radiological Defense Lab., San Francisco.

DEPTH-DOSIMETRY BY MEANS OF A GEL-INCORPORATED CHEMICAL SYSTEM. J. F. Pestaner and L. H. Gevantman. July 18, 1958. 20p. Project No. NS-081-001.

A technique is described for depth-dose measurements in tissue-equivalent material irradiated with low energy x rays. A cylinder of tissue-equivalent wax (Mix D), simulating a dog's body, was bored at a right angle to its longitudinal axis to accommodate a firm aqueous gel plug containing trichloroethylene and bromocresol purple. This system was irradiated under both stationary and rotating conditions; the gel plug was removed and sliced for analysis. The change in H^+ concentration, at various depths, due to irradiation decomposition of the trichloroethylene was determined through measurements of associated change in optical density of the bromocresol purple. These changes were related to energy absorbed. In the region of investigation the $G_{H^+} = 135 \pm 6$. The midline dose was established as (3.3 ± 0.31) % of the free air dose for the rotated phantom. (auth)

13326 WADC-TN-56-190

Wright Air Development Center, Wright-Patterson AFB, Ohio.

STANDARD INSTRUMENTATION TECHNIQUES FOR

NUCLEAR ENVIRONMENTAL TESTING. Grodon K. Dicker, Roy L. Shipp, and Carl L. Oakes, Jr. Apr. 20, 1956. 12p. Project No. 6001.

Techniques for measurement of parameters in radiation environments of nuclear-propelled aircraft are outlined. These proposed standard methods are the simplest, least expensive, most adaptable ones presently available. (T.R.H.)

13327

A NEW SENSITIVE NUCLEAR EMULSION P/22 (PREPARATION AND PROPERTIES). L. Medveczky and A. Polster. Acta Phys. Acad. Sci. Hung. 8, 211-30 (1957). (In German)

The factors which affect the preparation of nuclear emulsion were investigated. On the basis of the results of this study, a new nuclear emulsion, the sensitivity of which for electrons is 30 kev, was prepared. (tr-auth)

13328

CHARGE IN THE PULSE AS A FUNCTION OF THE OVERVOLTAGE OF A GEIGER-MUELLER COUNTER WITH METALLIC AND GLASS CATHODE. S. Michalak and A. Zawadzhi (Univ. of Lodz, Poland). Acta Phys. Polon. 15, No. 1, 63-70(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8531.)

A study was made of Geiger-Mueller counters to determine the proportionality coefficient K between the magnitude of the charge in the pulse and the excess voltage above threshold. From the Wilkinson theory it was shown that the coefficient can be represented in the form K = AC, where C is the capacitance of the counter and A is a constant depending on the diameter of the wire anode. It was found that this dependence applies both to counters with internal metallic cathodes and to counters with external cathodes. (J.S.R.)

13329

IMMERSION GEIGER-MUELLER COUNTER FOR RECORDING β RAYS. J. Wesolowski (Boleslaw Bierut Univ., Wroclaw). Acta Phys. Polon. 15, No. 2, 146-7 (1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8530.)

The construction of a thin-wall counter for the measurement of the β activity of liquids is given. A positive potential is applied to the filament of the counter; the "minus" of the voltage source is connected to the metallic vessel, which is filled with the liquid to be investigated. The counter is used to determine the quantitative contents of K in salts.

13330

CADMIUM SULPHIDE DETECTS RADIATION. Lewis E. Hollander, Jr. Atomics and Nuclear Energy 9, 231-3, 245(1958) July.

The theory of photoconductive crystals as radiation detectors is discussed. Instrumentation is greatly simplified by the use of solid conductor detectors. The properties of cadmium sulfide crystals as radiation detectors are surveyed at length. Single crystals are used for x and gamma rays while sintered polycrystalline films are suitable for α, β, and low-energy x radiation. Solid conductor detectors are coming more into prominence because of their high stopping power and high quantum efficiency. (T.R.H.)

13331

MAGNETIC SPECTROMETER HAVING INCLINED PLANE POLE-FACES FOR LOW-ENERGY ELECTRONS. Susumu Kato (Osaka Univ.). J. Phys. Soc. Japan 13, 544-8(1958) June.

A magnetic spectrometer with inclined plane pole faces has been constructed for the velocity analysis of low-energy electrons. The momentum dispersion of the spectrometer is about 3 times larger and the solid angle of the collection is more than 10 times wider than those of a conventional semi-circular spectrometer of similar dimensions. The equation which determines the momentum dispersion was obtained and the conditions for focusing are discussed. (auth)

13332

A PORTABLE APPARATUS FOR RECORDING THE RATE OF CLEARANCE OF RADIOACTIVE SODIUM FROM HUMAN CALF MUSCLE. L. Molyneux, J. Turnbull, and D. N. Walder (Univ. of Durham, Eng.). J. Sci. Instr. 35, 259-61(1958) July.

The apparatus consists of a halogen quenched Geiger-Mueller counter which straps over the muscle to be tested and a light pack which is carried on the subject's back. The pack contains, in addition to batteries, the high tension generator for the counter, an electronic circuit in which alternate pulses from the counter are used to trigger a pulse generator, a wire recorder to record the pulses, and a ratemeter for monitoring purposes. The record obtained on the wire recorder is subsequently played back in the laboratory, and after amplification the pulses are fed back into the monitoring ratemeter, the output from which is amplified and used to drive a recording milliammeter. (auth)

13333

EMULSION CAMERA. V. V. Alpers and A. A. Varfolomeyev. Pribory i Tekh. Ekspt. No. 1, 28-32(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8598.)

A descritpion is given of a procedure for preparing and using packets of emulsion layers as a solid emulsion camera for the recording of charged particles. The construction of a camera made of round emulsion layers 10 cm in diameter is described. The method of photographic treatment of the layers and the method of gluing them on glass after processing is given. The method for tracking the trajectories of the particles through the packet by means of a coordinate grid drawn on the camera by x rays is also discussed.

13334

SPRING STAGE FOR MEASURING MULTIPLE SCATTERING OF PARTICLES IN A PHOTOGRAPHIC EMULSION. G. Ye. Belovitskiy, V. N. Golovin, and L. V. Sukhov (Physics Inst., Academy of Sciences, USSR). Pribory i Tekh. Ekspt. No. 1, 162-5(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8599.)

A description is given of the construction of a spring stage, having very low noise level (~ 0.01 to 0.03μ). The noise measurement occurring during vertical displacement of the objective was made, as was the measurement of thermal noise due to non-uniform heating of various parts of the microscope. Steps to permit substantial reduction of the thermal noise are proposed.

13335

A VERSATILE RADIATION MEASURING APPARATUS. Friedrich H. Rinn. Siemens-Z. 32, 360-5(1958) May. (In German)

A description is given of a versatile radiometric apparatus containing G-M counters, proportional counters, and scintillation counters. The instrument (comprising the following plug-in units: a high tension generator, and imput amplifier, a pulse amplitude analyzer, an average value indicator, a counting unit, and an electronic clock) can be arranged in all kinds of combinations, from the simplest to the most comprehensive. A comparison is given between possible requirements and actual performance. (tr-auth)

13336
A SENSITIVE COUNTER ARRANGEMENT FOR CONTINUOUS MONITORING IN WATER. R. Plesch. Siemens-Z. 32, 385-6(1958) May. (In German)

A G-M counter arrangement is described which is placed in the water to be monitored and which gives an alarm at an increase in radioactivity. (tr-auth)

13337
AN ELECTRONIC METHOD FOR THE IMPROVEMENT OF THE CONTRAST IN THE SCINTIGRAPHY OF THE THYROID GLAND, LIVER, ETC. Wolfgang Horst, Hans-Joachim Heymann, and Hans-Joachim Tepe (Universitätskrankenhaus Hamburg-Eppendorf). Strahlentherapie 106, 191-201(1958). (In German)

The legibility of a scintigram is considerably disturbed by the so-called background. The authors, therefore, describe an electronic method which allows to record only that part of the different impulse frequencies produced on an organ, of which the frequency exceeds a certain eligible amount. Furthermore, the amplitude of the reduced and formed impulses coming from the radiation receiver is so modulated that the height of impulses becomes proportional to the momentary counting rate. Impulses of a freely eligible minimum height then pass the discriminator stage of amplitude and reach the printing mechanism. If we regard the isoimpulse image or scintigram as an activity relief, the impulse rate discriminator allows to lay intersecting planes at any level of the activity relief. The authors demonstrate the importance of this background suppression or impulse rate discriminator by means of scintigrams of the thyroid gland and of the liver. Contrary to the hitherto explained methods for the increase of contrast in scintigraphy, the described impulse rate discriminator does not deform the activity relief. (auth)

13338
CHEMICAL METHODS IN DOSIMETRY OF IONIZING RADIATION. A. M. Kabakchi and V. A. Gramolin. Uspekhi Khim. 27, 459-80(1958) Apr. (In Russian)

A review is given of methods for the determination of x ray, γ ray, and fast electron doses (produced by radioactive decay or generated in special apparatus) up to 10^5r. (R.V.J.)

13339
RECENT STUDIES OF COUNTERS. Serge A. Korff (New York Univ.). pp. 558-61 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Societa Italiana di Fisica.

The results of investigations on time lags and non-flat plateaus of halogen-quenched counters, the ultraviolet absorption spectrum of BF_3, and the "radius effect" in BF_3 counters are reported. In the study of the halogen-quenched counters it was found that the time lag depends on overvoltage and the filling gases. Analysis of the discharge mechanism suggested that the lags were caused by the comparatively long time needed for the metastable states formed in the buildup of the avalanche to become deexcited. The plateau slope is dependent on the halogen concentration. Increasing the halogen concentration decreases the time lag, but increases the plateau slope. The investigation of the ultraviolet absorption spection of BF_3 showed strong absorption in the regions 2700 to 2515 and 2300 to 1215 A. The "radius effect" is that it appears to be difficult to produce large diameter counter with good plateaus, but it is easy to make good ones of small diameter. Preliminary work on this problem shows that the radius effect is not caused by a simple effect such as negative ion effects, and the phenomenon is not an end effect. The limiting radius was found to be 2.5 cm. (J.S.R.)

13340
THE GROWTH OF THE CURRENT PULSE IN HALOGEN COUNTERS. P. F. Little (Clarendon Lab., Oxford). pp. 607-19 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The growth of the current pulse in halogen counters was measured on two triple counters—three separate Geiger-Mueller tubes in one common containing vessel. In one apparatus the anode wires were of constant diameter and the cathode diameters were 6, 18, and 54 mm. In the other apparatus the cathode diameters remained constant, but the anode diameters were 0.1, 0.3, and 1 mm. By using a triple counter, the dependence of the behavior on geometry could be studied in identical gas fillings. Measurements of the size of the pulses in the counter with varying cathode diameters were made, and the influences of anode resistance, parallel capacity, and geometry were determined. At low voltages the effect of the anode resistance is small, but at high voltages the anode resistance has a marked influence. At lower voltages the charge is independent of the capacity, but at higher voltages the charge increases with the capacity. As the cathode diameter increases the charge per pulse falls. The effect of changing the anode diameter is not as great. The delay before a pulse appears and the maximum current in the pulse were studied. (J.S.R.)

13341
VELOCITY OF DISCHARGE PROPAGATION IN COUNTERS. P. Mortier. pp. 722-7 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

The velocity of the discharge propagation of the Geiger tube was measured in counters with various anode and cathode radii and filled with argon (9 cm of Hg) and alcohol (1 cm of Hg). The cathodes were brass tubes and the anodes were molybdenum wires. The results are graphed. (J.S.R.)

13342
FISSION IONIZATION CHAMBER FOR THE MEASUREMENT OF WEAK FLUX OF THERMAL NEUTRONS. J. Weill and J. P. Duchene (Centre d'Etudes Nucleaires de Saclay, France). pp. 1145-55 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In French)

A fission chamber is described which is designed to measure thermal neutrons of average or weak intensity in the presence of very high gamma radiation. The construction, operation, and characteristics of the chamber are discussed. (J.S.R.)

13343
A COUNTING CHANNEL PULSE TRANSMISSION CIRCUIT. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 156, Session 28. John Parnell (Minneapolis-Honeywell Regulator Co.). New York, American Institute of Chemical Engineers, 1958. 11p.

The conventional low-level counting channel used in starting up a nuclear reactor usually consists of a BF_3 or fission counter connected to a low-level preamplifier by a 30 ft coaxial cable, which is in turn connected to the linear amplifier through about 200 feet of cable which contains both power and signal conductors. A

system is described which eliminates the use of the locally mounted preamplifier and substitutes a passive coupler at the chamber and at the linear amplifier chasis. A single coaxial cable is used to connect the two couplers and serves to transmit both pulses to the linear amplifier and the d-c to the chamber. The equipment is designed to solve some of the problems associated with the start-up channel of a nuclear reactor. (J.R.D.)

Mesons

13344 UCRL-8302

California. Univ., Berkeley. Radiation Lab. π^--p ELASTIC SCATTERING AND SINGLE PION PRODUCTION AT 0.939 BEV/c (thesis). Lee Baggett, Jr. May 28, 1958. 64p. Contract W-7405-eng-48. $10.80(ph OTS); $3.90(mf OTS).

Submitted to United States Naval Postgraduate School, Monterey, Calif.

An investigation of π^--p elastic scattering and single-pion production at 0.939 Bev/c is reported. Five-hundred and forty two-prong interactions in the 10-in. UCRL liquid-hydrogen bubble chamber were classified. Emphasis is given the methods used in the kinematic classification of events. The total cross section for π^--p interactions is found to be 53.3 ± 2.4 mb. The elastic-scattering cross section is 21.0 ± 1.1 mb. The elastic differential cross section displays a narrow diffraction peak in the forward direction. In the center-of-mass system, 35.6% of the elastic events have pion scatters into the backward hemisphere. In single-pion production the ratio of the number of π^+ to π^0 productions is 2.49. The momentum distributions of the charged particles do not correspond to the phase-space distributions predicted. (auth)

13345 UCRL-8317

California. Univ., Berkeley. Radiation Lab. DETERMINATION OF THE PION-NUCLEON COUPLING CONSTANT FROM PHOTOPRODUCTION ANGULAR DISTRIBUTION. John G. Taylor, Michael J. Moravcsik, and Jack L. Uretsky. June 9, 1958. 11p. Contract W-7405-eng-48. $0.50(OTS).

It is conjectured that the amplitude for photoproduction of π mesons from nucleons possesses certain reasonable analyticity properties as a function of the invariant momentum transfer. If the conjecture is correct it is possible to continue an angular distribution to a pole lying just outside the physical region. The residue at the pole can be evaluated and provides a determination of the pion-nucleon coupling constant. A preliminary determination gives $f^2 = 0.0716 \pm 0.0302$. (auth)

13346

ON THE INTERACTION BETWEEN K-MESONS, PIONS, NUCLEONS AND HYPERONS. V. S. Barashenkov (Joint Inst. of Nuclear Research, Dubna, USSR). Nuclear Phys. 7, 146-7(1958) June (2).

13347

THE HYPERON DECAYS AND THE STRUCTURE OF INTERACTIONS. Hiroomi Umezawa, Michiji Konuma, and Kimiko Nakagawa (Univ. of Tokyo). Nuclear Phys. 7, 169-83(1958) June (2).

Experiments have shown that, in cases of the weak fermion interactions and π-decay interaction, the coupling constant for the parity conserving term and that for the parity non-conserving term are almost equal to each other. Assuming that this is the situation in every case of the weak interactions, it is shown that the Λ-decay interaction is of the derivative (vector and axial vector) coupling type. This belongs to the 2nd kind interactions, as do the weak fermion interactions. Various features are discussed which stem from the basic assumption that all the weak interactions violating the parity conservation belong to the 2nd kind. A result coming from this basic assumption is the universality of the coupling constants for the weak interactions. The two-neutrino decay of K is forbidden as it should be. The situation for the processes $\pi, K \rightarrow e + \nu$ and $e + \nu + \gamma$ is much better than in the case of the weak interactions of the 1st kind. A dimensional analysis is used to obtain information on the strength of interactions in each energy region. It suggests that the weak interactions belonging to the 2nd kind predominate over all the other interactions in the high energy region corresponding to a scale smaller than 10^{-20} cm. The violation of the parity conservation may be due to some feature of space for such small distances. It is suggested that multiple production of leptons may occur at extremely high energies. The high energy behaviour of the strong interactions like the π-nucleon coupling is briefly discussed; the nucleon Compton wave-length may characterize a region where the strong interactions behave in a way different from ordinary notions. In this sense, we may meet various strata of nature in high energy regions. (auth)

13348

INNER BREMSSTRAHLUNG IN Mu-MESON DECAY. N. Tzoar and A. Klein (Univ. of Pennsylvania, Philadelphia). Nuovo cimento (10) 8, 482-4(1958) May 1.

The transition probability for decay of the μ meson with the emission of an additional photon is computed on the basis of the most general two-component theory of the neutrino with lepton conservation. The estimated ratio of one radiative event per 10^5 decays suggests that the experiment may be feasible in the near future. (auth)

13349

ON THE POLARIZATION OF ELECTRONS IN μ-MESON DECAY. B. Jakšić and J. Soln (Univ. of Zagreb). Nuovo cimento (10) 8, 497-500(1958) May 1.

13350

K-MESON-NUCLEON INTERACTIONS AND THE RELATIVE $\Sigma-\Lambda$ PARITY. Saul Barshay (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 97-8(1958) Aug. 1.

The K$-\Lambda$ relative parity is odd relative to the nucleon, and the K$-\Sigma$ relative parity is even relative to the nucleon. Some arguments for the preceding conjecture are made which are based on perturbative estimates including certain higher-order effects. The considerations are nonrelativistic in the sense that baryon-antibaryon pair states are not considered. (W.D.M.)

13351

EXPERIMENTAL EVIDENCE FOR THE INFLUENCE OF ATOMIC BINDING ON THE DECAY RATE OF NEGATIVE MUONS. R. A. Lundy, J. C. Sens, R. A. Swanson, V. L. Telegdi, and D. D. Yovanovitch (Univ. of Chicago). Phys. Rev. Letters 1, 102-4(1958) Aug. 1.

In order to make precise determinations of the rate of nuclear capture of muons for the disappearance of muons, the ratio $R = \Lambda_{dec}(Z)/\Lambda_{dec}(0)$ was measured directly for a variety of elements. Some preliminary results are given. (W.D.M.)

13352

PHOTOPRODUCTION OF K MESONS. B. D. McDaniel, A. Silverman, R. R. Wilson, and G. Cortellessa (Cornell

Univ., Ithaca, N. Y.). Phys. Rev. Letters 1, 109-11 (1958) Aug. 1.

The reaction $\nu + p \rightarrow K^+ + \Lambda^0$ was observed by detecting the K meson and measuring its laboratory angle and momentum. Since the reaction is 2-bodied, these measurements, together with the conservation laws, are sufficient to determine the energy of the incident photon. Preliminary results are given. (W.D.M.)

13353

MULTIPLE MESON PRODUCTION IN ELECTRON-PROTON COLLISIONS. Arnold D. Levine (West Virginia Univ., Morgantown). Phys. Rev. Letters 1, 111-12(1958) Aug. 1.

Some calculations pertaining to multiple meson production in electron-proton collisions are discussed. (W.D.M.)

13354

RADIATIVE BETA DECAY OF THE PION. G. H. Burkhardt (Univ. of Birmingham, Eng.); J. M. Cassels, M. Rigby, A. M. Wetherell, and J. R. Wormald (Univ. of Liverpool). Proc. Phys. Soc. (London) 72, 144-7 (1958) July.

Three unsuccessful attempts have been made recently to detect radiative beta decay of the pion, $\pi^+ \rightarrow e^+ + \nu + \gamma$. The theoretical situation is reviewed, and the negative results of further experimental work are reported. (W.D.M.)

13355

THE ENERGY SPECTRUM OF γ-QUANTA FROM THE DECAY OF PIONS. A. A. Iyapkin. Zhur. Eksptl. i Teoret. Fiz. 30, No. 6, 1150-1(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8631.)

A relation is obtained for the energy spectrum of the γ quanta $W(\Sigma_\gamma, \theta_n)$, observed at an angle θ_n as a function of the distribution of the neutral mesons $F(\Sigma_\pi, \theta_n)$. When the pion angular distribution is of the form $a + b \cos^2 \xi$, the angular distribution for the γ-quanta will have the form $A + B \cos^2 \xi$, where A and B are expressed in terms of a, b, and the energy spectrum of the pions $F(\Sigma_\pi)$.

13356

ELASTIC SCATTERING OF POSITIVE 310 Mev PIONS BY PROTONS. Ye. L. Grigor'ev and N. A. Mitin. Zhur. Eksptl'. i Teoret. Fiz. 31, No. 1, 37-9(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8637.)

A measurement is made of the angular distribution of 310 Mev positive pions, elastically scattered by protons in a photoemulsion. The differential scatterings cross section in the center of mass system was obtained on the basis of 427 determined events. The phase analysis, made under the assumption of a Fermi solution with allowance for only the S and P states, gave the following values for the phase shifts: $\alpha_3 = -23°$, $\alpha_{33} = 132°$, and $\alpha_{31} = -9°$. The D state apparently makes little contribution to the scattering, compared with the S and P states.

13357

ANGULAR ANISOTROPY IN $\pi^+ - \mu^+ - e^+$-DECAY OBSERVED IN A PROPANE BUBBLE CHAMBER. A. I. Alikhanyan, V. G. Kirillov-Ugryumov, L. P. Kotenko, E. P. Kuznetsov, and Yu. S. Popov (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1101-9(1958) May. (In Russian)

The angular anisotropy in $\mu^+ - e^+$- and $\pi^+ - \mu^+$-decays was measured. The dependence of the $\mu^+ - e^+$-decay anisotropy on the electron energy is not inconsistent with the two-component neutrino theory. $\pi^+ - \mu^+$-decays do not display angular anisotropy. (tr-auth)

13358

OBSERVATION OF DECAYS OF CHARGED PARTICLES IN A DOUBLE CLOUD CHAMBER. Z. Sh. Mandzhavidze, N. N. Roinishvili, and G. E. Chikovani (Inst. of Physics, Tiflis State Univ., Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1110-15(1958) May. (In Russian)

Ten events observed in a cloud chamber of the decay of unstable charged particles produced in penetrating showers by cosmic rays at an altitude of 1800 meters above sea level are analyzed. $V^\pm$-decays are divided into two groups depending on the place of generation. The upper limit of the mean lifetime for one of these groups is estimated to be $\tau \leq (1.44 \pm 0.83) \cdot 10^{-10}$ sec. An anomalous decay is considered which cannot be explained on basis of any of the K-particle or hyperon decay schemes existing at present. (tr-auth)

13359

ON K_{e3}-DECAY. I. G. Ivanter (Inst. of Scientific Information, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret Fiz. 34, 1202-6(1958) May. (In Russian)

The possibility is considered of determining the interaction constants and properties of the neutrino by studying the polarization and spectra of particles emitted in K_{e3}-decays. (tr-auth)

13360

ON THE INTERACTION OF Ξ^--HYPERONS WITH NUCLEONS AND LIGHT NUCLEI. L. B. Okun, I. Ya. Pomeranchuk, and I. M. Shmushkevich. Zhur. Eksptl'. i Teoret. Fiz. 34, 1246-9(1958) May. (In Russian)

Spin correlations are determined for Λ-particles produced in the $\Xi^- + p \rightarrow \Lambda + \Lambda$ reaction (slow Ξ^-). An experimental study of such correlations should permit one to establish the parity of Λ-particles. (tr-auth)

13361

ON THE POLARIZATION OF ELECTRONS EMITTED BY DECAYING μ-MESONS. L. B. Okun and V. M. Shekhter. Zhur. Eksptl'. i Teoret. Fiz. 34, 1250-3 (1958) May. (In Russian)

An expression for the energy spectrum, angular distribution, and polarization of electrons emitted by decaying polarized μ-mesons were obtained. The calculations are carried out for a decay interaction Hamiltonian of the most general form characterized by ten complex constants. It is shown that experiments performed up to the present time are not sufficient for verification of the predictions made in published literature. (tr-auth)

13362

ON THE "STRANGE" PARTICLE THEORY. L. A. Manakin (Kamenets-Podol'sk Pedagogical Inst.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1327-9(1958) May. (In Russian)

A new particle, the ω^0 meson with spin I = 0, is considered. (R.V.J.)

13363

TWO CLASSES OF LAGRANGIAN INTERACTIONS. V. G. Solov'ev (Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1335-6(1958) May. (In Russian)

Lagrangians for strong interactions of mesons and baryons were studied with considerations for their isotopic structure (according to A. Salam Nucl. Phys. 2, 173, 1956). It was noticed that wave functions of particles with similar isotopic multiplicity behave identically in all their transformations. (R.V.J.)

13364

ON THE SYSTEMATICS OF MESONS AND BARYONS. Kh. Yiglane (Inst. of Physics and Astronomy, Academy of Sciences, Estonian SSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1337-8(1958) May. (In Russian)

Classifications of baryons based on two quantum numbers, the third component of the isotopic spin t_3, and on the third component of the isotopic moment v_3, are tabulated. To obtain a similar scheme for mesons, nonreducible equations for free boson multiplicities were developed. The meson system completely coincided with the baryon system; only the triplet for the isotopic moment corresponding to baryons Ω^-, Λ^0, and Z^+ is absent. (R.V.J.)

13365
CONFIRMING THE ABSENCE OF THE CONSTANT RENORMALIZATION IN THE VECTOR VARIATION OF β INTERACTION. B. L. Ioffe. Zhur. Eksptl'. i Teoret. Fiz. 34, 1343-5(1958) May. (In Russian)

Infinitely small transformations were developed for β interactions with the complete Lagrangian for nucleons and π mesons (with consideration for their interactions other than with the electromagnetic field) to confirm the R. Feynmann and M. Gell-Man (Phys. Rev. 109, 1, 1958) assumption. Considerations for interactions with the electromagnetic field disturb the transformation group and lead to the renormalization of the constant. (R.V.J.)

13366
PROBLEMS ON DETERMINATION OF K_{e3}-DECAY VARIATIONS. I. Yu. Kobzarev. Zhur. Eksptl'. i Teoret. Fiz. 34, 1347-9(1958) May. (In Russian)

A method, analogous to R. H. Dalitz, Phys. Rev. 94, 1046, 1954, is offered for the decay analysis of long-life K_2^0 mesons, $K_2^0 \rightarrow e^{\pm} + \nu + \pi^+$. The double charged particles permit a complete kinematic analysis. (R.V.J.)

13367
Λ-NUCLEON POTENTIAL IN MESON THEORY AND Λ-PARTICLE ENERGY IN LIGHT HYPERNUCLEI. V. A. Filimonov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1355-6(1958) May. (In Russian)

The Λ-nucleon potential and the forces between the Λ and nucleon were calculated for the exchange of a single K, two π, K + π, and two K mesons on the basis of Hamiltonian interactions. (R.V.J.)

Meteorology

13368 IDO-12003
Weather Bureau, Idaho Falls, Idaho.
THE CLIMATOLOGY OF THE NATIONAL REACTOR TESTING STATION. G. A. De Marrais. June 1958. 49p. $7.80(ph OTS); $3.30(mf OTS).

The general climatology of the National Reactor Testing Station is described with particular emphasis on temperature, relative humidity, precipitation, snowfall, winds, pressure, and special phenomena. The reasons for any significant variations in the observed meteorological parameters are discussed. (auth)

13369 SCL-T-184
VARIOUS COMPARATIVE EXPERIMENTS WITH RADIOSONDES. (Diverses Experiences de Comparaison de Radiosondes.) L. M. Malet. Translated by Marcal I. Weinreich (Sandia Corp.) from Organisation Meteorol. Mondiale. No. 35, TP. 11 (1954). 19p.

Radiosonde data are given from various experiments, and the systematic and random errors of radiosondes are discussed. (T.R.H.)

13370
FALLOUT HELPS WEATHER STUDIES. W. F. Libby (Atomic Energy Commission, Washington). Atomics and Nuclear Energy 9, 236-7, 245(1958) July.

The possible contributions to meteorology of isotope tracers in the atmosphere are surveyed. Long-range studies involving Sr^{90} and Cs^{137} from bomb fall-out should establish stratospheric mixing rates and patterns, storage time, and general applicability of the single residence time to all stratospheric components. The occurrence and behavior of natural and bomb-produced tritium is discussed. Atmospheric radon should provide a key to the study of latitudinal mixing. Other radioactive isotopes occur in the atmosphere and the possibilities for meteorological research using tracers are great. (T.R.H.)

13371
REMARKS ON THE RADIOACTIVE POISONING OF THE ATMOSPHERE. H. Israel and H. Reifferscheid. Atomkern-Energie 3, 255-60(1958) July. (In German)

If the quantities of the natural and the artificial radioactivity in the atmosphere are considered, it is noticed that these values are changed continually by influences of the weather. It is demonstrated that this "meteorological regulation" can be understood by the combination of the production of atmospheric radioactivity, decay and fall-out, and the effects of transport by air motions and exchange. As an example, the transport of fission products from a nuclear explosion test in Nevada is shown. The consequences for the examination of radioactive contamination are discussed. (tr-auth)

Molecular Properties

13372
GENERAL RELATIONS BETWEEN ADSORPTION AND RADIATION FOR MODULATION SPECTRA OF POLYATOMIC MOLECULES. B. S. Neporent. Doklady Akad. Nauk S.S.S.R. 119, 682-5(1958) Apr. 1. (In Russian)

General equations were derived describing all relations between the absorption and radiation spectra of polyatomic molecules with modulated spectra. The equations hold true for simple polyatomic molecules which retain their spectral structure and for complex molecules in which strong interactions between normal oscillations align the oscillation systems in normal or excited electron states and in which spectral symmetry presents a certain finite regularity. (R.V.J.)

13373
CALCULATION OF THE 1s-2s ELECTRON EXCITATION CROSS SECTION OF HYDROGEN. R. Marriott (University Coll., London). Proc. Phys. Soc. (London) 72, 121-9(1958) July.

The zero order partial cross section for the excitation of hydrogen from the (1s) to the (2s) states by electron collision has been calculated by a numerical method. Full allowance has been made for electron exchange and all direct coupling between the initial and final atomic states has been retained. The cross sections obtained are compared with those that have been calculated by more approximate methods. In particular, the cross section near the threshold is found to be considerably smaller than that given by Erskine and Massey using the distorted wave approximation. (auth)

Neutrons

13374 ANL-5860(Pts. I and II)
Argonne National Lab., Lemont, Ill.
SUPPLEMENT TO A TABLE OF WIGNER 9j COEFFICIENTS FOR INTEGRAL AND HALF-INTEGRAL VALUES OF THE PARAMETERS. Kenneth Smith.

Apr. 1958. (Pt. I, 406p. and Pt. II, 406p.) Contract W-31-109-eng-38. $8.50(OTS) per two-volume set.

Numerical tables of the Wigner 9j coefficient,

$$\begin{pmatrix} a & b & e \\ c & d & f \\ g & h & k \end{pmatrix}$$

are given in decimal form. The range of the nine parameters is extended to cover the range $\frac{1}{2} \leq a, b, c, d \leq \frac{7}{2}$; $0 \leq e, f, g, h, k \leq 7$. (auth)

13375 APEX-395

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

THREE GROUP NEUTRON DIFFUSION CALCULATION (PROGRAM-F_3—IBM 704). J. G. Keppler and W. L. Orr. May 27, 1958. 32p. (XDC-58-7-18). $6.30(ph OTS); $3.00(mf OTS).

Program F_3 provides an analysis of a three group, one-dimensional reactor in multi-region slab or cylindrical geometry. Input consists of a description of the geometry of the assembly, energy group constants defining the nuclear characteristics of each region, and control information specifying the type of calculation desired. The fission density and neutron flux, computed at each lattice point, are used to calculate the reactivity of the system. (auth)

13376 NAA-SR-2380

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

APPLICATION OF FAST NEUTRON REMOVAL THEORY TO THE CALCULATION OF THERMAL NEUTRON FLUX DISTRIBUTIONS IN REACTOR SHIELDS. D. S. Duncan and H. O. Whittum, Jr. July 1, 1958. 42p. Contract AT-11-1-GEN-8. $1.25(OTS).

A calculational method is presented which may be used to determine fast and thermal neutron flux distributions at deep neutron penetrations in hydrogenous shields. The method is based primarily on fast neutron removal theory, which is used in conjunction with a two-group diffusion model for calculating the thermal neutron flux distribution. A comparison of calculated flux distributions with the results of experimental measurements made in the shield of the Bulk Shielding Reactor and in a portion of the Submarine Thermal Reactor shield mock-up indicates that the method is accurate in the hydrogenous shield regions at several diffusion lengths from nonhydrogenous boundaries. However, the method is only approximately correct in the remaining shield regions. Although it is recommended that other methods be investigated in future neutron penetration studies, it is concluded that the method presented is extremely useful for many reactor shield calculations because it is relatively simple to apply and yields excellent results in the hydrogenous portions of a composite shield. (auth)

13377

DEUTERIUM AND TRITIUM TARGETS FOR NEUTRON SOURCES. E. J. Wilson (Atomic Energy Research Establishment, Harwell, Berks, Eng.) and C. Evans (A.W.R.E., Aldermaston, Eng.). Atomics and Nuclear Energy 9, 238-41(1958) July.

Cheap neutron sources are provided in deuterium and tritium targets for low-energy generators. The preparation and characteristics of these targets at AERE, Harwell is described. (T.R.H.)

13378

INVESTIGATIONS OF THE INELASTIC SCATTERING OF FAST NEUTRONS. Tasso Springer (Technischen Hochschule, Munich). Nukleonik 1, 41-8(1958) July. (In German)

In order to study the attenuation of fast neutrons by inelastic collisions, the average energy $\bar{E}$ of neutrons from a Ra–Be source was determined before and after passage through lead and bismuth spheres of different average densities. The determination was done by a measurement of the thermal neutron flux distribution by a probe sphere in a water moderator. By means of the average impact number $\bar{i}$ for neutrons in different probe spheres determined by a Monte Carlo method, the dependence between $\bar{E}$ and $\bar{i}$ was derived and interpreted by a simple moderation model. (tr-auth)

13379

RESONANCE ABSORPTION IN HETEROGENEOUS SYSTEMS. Gerhard Memmert (Kernreaktor-Bau- und Betriebsgesellschaft, Karlsruhe, Germany). Nukleonik 1, 48-57(1958) July. (In German)

The resonance integral for neutrons in spheres and cylinders of uranium was determined by a method which was modified from that of Gurevich and Pomeranchouk and which leads to the same general result. From the ratified form of the resonance integral for uranium metal, the resonance integral was determined for those cases in which neutron scattering is important, especially for mixtures of uranium with light moderators (as oxides, carbides, etc.) and for hollow cylinders which are filled with moderators. The results for uranium oxide and for hollow cylinders filled with H_2O, D_2O, and air are compared with the results of Hellstrand. It is emphasized that these results were obtained without further normalization or adjustment direct from the measured resonance integral for U metal. (tr-auth)

13380

THE P_N^* METHOD FOR THE SOLUTION OF THE NEUTRON TRANSPORT EQUATION. H. Koppe and G. Blasser (Universität Heidelberg and Reaktorstation, Karlsruhe, Germany). Nukleonik 1, 64-6(1958) July. (In German)

The transport equation of even problems was converted by development of the neutron flux according to the orthogonal functions of the hemisphere in a system of coupled differential equations, which was solved approximately. As an example, the calculation of the extrapolation length shows good convergence of the method. Finally, the asymptotic solutions are treated in the first approximation, and some general principles are discussed. (tr-auth)

13381

INVESTIGATION OF TIME-REVERSAL INVARIANCE IN THE BETA DECAY OF THE NEUTRON. M. A. Clark and J. M. Robson (Atomic Energy of Canada, Ltd., Chalk River) and R. Nathans (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 100-1(1958) Aug. 1.

It has been pointed out that a violation of time-reversal invariance in the beta decay of the neutron would give rise to a term of the form $D\vec{J} \cdot (\vec{P}_e \times \vec{P}_\nu)/JE_eE_\nu$ in the angular distribution of the decay products. The magnitude of the coefficient D, using a beam of neutrons from the NRX reactor as a source, was measured. (W.D.M.)

13382

OBSERVATION OF PARTICLES OF CHARGE $Z > 2$ IN DISINTEGRATIONS PRODUCED IN PHOTOGRAPHIC EMULSIONS BY HIGH-ENERGY NEUTRONS. V. M. Sidorov and E. L. Grigoriev (Joint Inst. for Nuclear

Research). Soviet Phys. JETP 6, 906-10(1958) May.

Experimental data are given on the observation of particles of charge Z > 2 in disintegrations produced in nuclear emulsion by high-energy neutrons. The neutrons had a broad energy distribution with a maximum in the 395-Mev region. Measurements were made of the cross section for the emission of heavy particles, their angular and energy distributions, and their charge distribution. (auth)

Nuclear Physics

13383 AFOSR-TN-58-499

Princeton Univ., N. J. Palmer Physical Lab.
ELECTROMAGNETIC STRUCTURE OF THE NUCLEON. P. Federbush, M. L. Goldberger, and S. B. Treiman. [1958]. 69p. (AD-158309).

The electromagnetic structure of the nucleon is studied using dispersion relation techniques. Contributions to the magnetic moments and mean square radii from the two pion intermediate state are studied exhaustively. It is shown that the electromagnetic structure of the meson itself may play an important role here; this structure is also discussed. The two pion state seems to account reasonably for the isotopic vector magnetic moment and magnetization mean square radius, but the charge density radius appears to be much smaller than the currently accepted experimental value. As regards the isotopic scalar properties of the nucleon we have studied the contributions from intermediate states with two K-mesons and nucleon-antinucleon pairs (more generally baryon pairs). The K-meson state is treated by perturbation theory and found to have a small effect. Using an argument based on the unitarity of the S-matrix it is shown that the pair contributions must be small. Certain general properties of the three pion state, believed to be the most important contributor to isotopic scalar quantities, are discussed; but we are unable to make any quantitative statements. (auth)

13384 BNL-502

Brookhaven National Lab., Upton, N. Y.
QUARTERLY PROGRESS REPORT [FOR] JANUARY 1-MARCH 31, 1958. 56p. $1.50(OTS).

Progress in physics, chemistry, biology, medicine, and accelerator and reactor development is briefly summarized. (For preceding period see BNL-484.) (M.H.R.)

13385 CU-171

Columbia Univ., New York. Pupin Cyclotron Lab. and Columbia Univ., New York. Geores B. Pegram Lab.
PROGRESS REPORT FOR OCTOBER, NOVEMBER, DECEMBER 1957 TO THE UNITED STATES ATOMIC ENERGY COMMISSION. 58p. $9.30(ph OTS); $3.60 (mf OTS).

The operation of the Nevis neutron velocity spectrometer was substantially improved. The peak-to-valley ratio is better than 5 to 1, and the over-all intensity was increased by a factor of 10. Measurements were made on the energy dependence of the U^{235} fission cross section. A more resolved plot of neutron resonances in cadmium was prepared. The investigation of fission fragment mass distribution from p-wave neutron fission in U^{235} was continued. The scintillation efficiency of an argon-nitrogen phosphor was determined. Cyclotron modifications made to obtain greater beam control are reviewed. The intermediate image pair spectrometer was assembled and tested as an electron spectrometer. Measurements are reported on the 1.069 and 0.569 Mev transitions in Bi^{207}. The average fission, capture, and inelastic scattering cross sections of U^{235} were calculated using the methods of Hauser and Feshbach. A theorem of Porter's for diffusing the edge of a complex potential was generalized to the case of non-spherical wells. Several experiments are suggested for testing the time reversal property of beta decay. A fast coincidence circuit was designed for use with the intermediate image pair spectrometer. A special photomultiplier circuit for fast-slow coincidence work was designed and satisfactorily operated. The 256-channel pulse height analyzer was altered so it can be divided into two 128-channel analyzers. An electronic divider circuit was designed for use in fission fragment mass distribution studies. An automatic control system for use in beta-ray polarization studies was also designed. The block diagram is given for a fast non-blocking linear amplifier. The apparatus used and preliminary results from electron and positron polarization experiments are described. The half-life of O^{15} decay to N^{15} was found to be 124 sec. (For preceding period see CU-169.) (D.E.B.)

13386 ORNL-2556

Oak Ridge National Lab., Tenn.
NUCLEAR STRUCTURE EFFECTS IN INTERNAL CONVERSION COEFFICIENTS BY CONFIGURATION MIXING. L. S. Kisslinger. Aug. 6, 1958. 53p. Contract W-7405-eng-26. $1.50(OTS).

The nuclear matrix elements needed to determine the internal conversion coefficients when a finite nucleus is employed are derived for nuclei for which the shell model wave functions are a good zero-order approximation for low-energy processes. Using configuration mixing, general expressions are derived for these matrix elements. It is shown that the nuclear structure alteration can be ten to twenty percent or more for l-forbidden transitions. Numerical results are given for the M1 and E2 transitions in Tl^{203}. (auth)

13387 UCRL-3798

California. Univ., Berkeley. Radiation Lab.
BRIEF REVIEW OF THE ALLOWED BETA TRANSITION. Tsuneyuki Kotani. May 21, 1957. 34p. Contract W-7405-eng-48. $6.30(ph OTS); $3.00(mf OTS).

The results of theoretical calculations are listed, and experimental data are briefly reviewed. If the present experimental results are correct, either the assumption of time reversal invariance or the present formalism of the two-component neutrino, or both, may have to be abandoned. (auth)

13388 UCRL-4518

California. Univ., Livermore. Radiation Lab.
GRAVITATIONAL-ELECTROMAGNETIC TORUS MODELS OF THE ELEMENTARY PARTICLES. Winston H. Bostick. June 23, 1955. 11p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A torus model of the elementary particles is suggested in which the electron and proton are made stable by gravitational forces derived from the electromagnetic field. It is suggested that the gravitational forces for the unstable particles, presumably the mesons, are not sufficient to keep the torus from expanding in the direction of its large radius. Rest energy zero can be achieved, presumably for photons and neutrinos, when the gravitational energy and electromagnetic field energy are equal in magnitude. The manner in which these models can exhibit spin, magnetic moment, wave length, and phase velocity is indicated. The origin of nuclear forces from an electromagnetic basis is indicated. (auth)

13389 UCRL-5209

California. Univ., Berkeley. Radiation Lab.

THE ASYMPTOTIC TIME-DEPENDENT TRANSPORT EQUATION. Joel Bengston. Apr. 1958. 6p. Contract W-7405-eng-48. $0.50(OTS).

A multiplying system is considered in which the neutron distribution has settled down to the normal mode but the population is varying with time as $e^{\alpha t}$. It is then shown that the customary diffusion equation

$$\frac{1}{v}\frac{\partial \phi}{\partial t} = D\nabla^2 \phi + (c-1)\,\sigma\phi$$

can be used far from boundaries if

$$D = \frac{(1-c)\,\sigma + \frac{\alpha}{v}}{k^2}$$

where k^2 is obtainable from

$$\operatorname{arth}\frac{k}{\sigma + \frac{\alpha}{v}} = \frac{k}{c\sigma}.$$

An expansion is then obtained which is valid for

$$\left|1 - \frac{kc}{1 + \frac{\alpha}{\sigma v}}\right| \ll 1, \frac{1}{D} \simeq 3\,\sigma\left(\frac{1+4c}{5} + \frac{1}{5}\,\frac{\alpha}{\sigma v} + \ldots\right).$$

The coefficient of the $\alpha/\sigma v$ term in this expansion is 1/5 that to be expected from use of the time-dependent P_1 approximation which gives rise to the telegrapher's equation, indicating that the usual time-dependent diffusion equation is preferable to the telegrapher's equation for the treatment of the problem considered. (auth)

13390 UCRL-5269-T

California. Univ., Livermore. Radiation Lab.

THE ELECTROSTATIC POTENTIAL ABOUT AN ATOMIC NUCLEUS IN AN IONIZED GAS. R. E. Kidder. June 1958. 14p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A simple approximate expression for the average potential about an atomic nucleus in an ionized gas is derived. A model similar to the Thomas-Fermi temperature-dependent model is used, and it is assumed that the positive charge of all nuclei, save only the one about which the potential is being calculated, is uniformly and continuously distributed throughout the space occupied by the gas. (T.R.H.)

13391 UCRL-8030

California. Univ., Berkeley. Radiation Lab.

DATA FOR ELEMENTARY-PARTICLE PHYSICS. Walter H. Barkas and Arthur H. Rosenfeld. Mar. 20, 1958. 21p. Contract W-7405-eng-48. $0.75(OTS).

Tables of elementary-particle data in easily accessible form are presented for researchers in high-energy physics. Included are: The Masses and Mean Lives of the Elementary Particles; Atomic and Nuclear Properties of Materials; Particle Scattering; Atomic and Nuclear Constants; and Particle Decay and Reaction Dynamics. (T.R.H.)

13392

ON A NEW TYPE OF INTERACTION BETWEEN NUCLEONS. P. Szepfalusy (Univ. of Technical Sciences, Budapest). Acta Phys. Acad. Sci. Hung. 6, No. 1, 87-103(1956). (Translated from Referat. Zhur. Fiz. No. 4, Abstract No. 8686.)

An attempt is made to describe the properties of the n-p system with the aid of a nonlinear Schrödinger equation which yields a spherically symmetrical stationary solution with negative energy. However, attempts at finding the stationary solutions that depend on angles lead to difficulties, since these solutions are not eigenfunctions of the square of the angular momentum and of its projection. This difficulty can be circumvented by taking into account the spins of the nucleons, and by taking in the interaction potential. By use of such an interaction potential, two solutions, which correspond to a total spin of 0 (singlet, spherically-symmetrical solution) and a total spin of 1 (triplet, linear combination of S and D waves), are found. By varying the constants it is possible to choose these solutions in such a way that they agree with the experimental characteristics of the deuteron.

13393

NUCLEAR REACTIONS IN DIRECT INTERACTIONS. O. Hittmair. Acta Phys. Austriaca 12, 84-90(1958). (In German)

The possibility of direct nuclear reactions in which no intermediate nucleus is formed is discussed. Unmistakable direct reactions are found for very high energies of the resulting particles on account of the transparency of the nucleus and for average and lower energies in surface reactions where the nuclear potential is not very effective. The differential effective cross section for direct processes was formulated and with the help of the method of pulse approximation was calculated for both cases. The effective cross sections obtained show an angular distribution characteristic of the nuclear initial and final levels. These can give important information relative to the spin difference and relative parity. (tr-auth)

13394

BOUND AND ABNORMAL STATES IN THE MESON-NUCLEON INTERACTION MODEL OF BOSCO AND STROFFOLINI. Michel Pécheux (Laboratorie de Physique de l'Ecole Normale Supérieure, Paris). Cahiers phys. 12, No. 91, 110-28(1958) Mar. (In French)

The model of Bosco and Stroffolini, where the meson-nucleon interaction produces only the processes $\pi \rightleftharpoons n + \overline{n'}$, can be treated rigorously. The singularities of the Lee model are found in this model. For a meson radius less than the critical radius and after renormalization and introduction of metric indeterminant, a bound state with a negative normal appears which destroys the unity of the S matrix. To obtain a correct definition of the S matrix, it is necessary to take into account the "displacement" of the kinetic energy W_k of the physical meson with regard to $\omega_k = \sqrt{k^2 + \mu^2}$, by subtracting $\Sigma(W_k - \omega_k)\alpha_k^*\alpha_k$ in the interaction Hamiltonian. (tr-auth)

13395

CONCERNING THE PROBLEM OF THE SYSTEMATIZATION OF β SPECTRA. Radko Seidl (Inst. of Technical Physics of the Czechoslovak Academy of Sciences, Prague). Czechoslov. J. Phys. 6, No. 2, 199-200(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5946.)

From data on the energy liberated during K capture or during β decay, the problem of the construction of a shell model of the nucleus is considered. It is proposed that the β transition is carried out by the last particle in the shell. The neutron and proton levels are considered individually. It is stated, that on the basis of the data on the β-transition energy for free nucleons, it is possible to construct a scheme for the ground levels of the nuclei. This scheme is in agreement with the experimental data with respect to the stability of the individual isotopes and the values of the nuclear spins. To obtain agreement with the nuclear binding energies and the

data on nuclear reactions, it becomes necessary to propose that the transition of each nucleon causes a lowering of the bottom of the potential well of the nucleus.

13396

THE CALCULATION OF THE CONSTANT FOR NUCLEAR MAGNETIC SHIELDING. I. V. Alexandrov (Inst. of Chemical Physics, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 119, 671-4(1958) Apr. 1. (In Russian)

The method of molecular orbits was used for calculating the constant of nuclear magnetic shielding. (R.V.J.)

13397

SPECULATIONS ON THE MASSES OF PARTICLES. H. Frohlich (Univ. of Liverpool). Nuclear Phys. 7, 148-9(1958) June (2).

The discovery of mesons and baryons poses the question whether the masses of these particles are related by a simple law. One would not expect this if these masses were to contain considerable contributions from field self-energies. It is shown that a simple empirical relation between the masses does exist on the assumption that the electromagnetic self-energy is the only self-energy involved. (A.C.)

13398

THE "CLUSTER MODEL" OF THE ATOMIC NUCLEI. K. Wildermuth and Th. Kanellopoulos (CERN, Geneva). Nuclear Phys. 7, 150-62(1958) June (2).

A method is discussed which makes it possible to see that in nuclei many different cluster structures are present. Which cluster structures are preferred depends on the form and strength of the interaction forces, the type of nucleus, and the excitation levels of this nucleus. Some examples are discussed. The influence on the asymmetrical fission is mentioned briefly. (auth)

13399

NON-LOCAL THEORY OF ELEMENTARY PARTICLES. P. Sen (National Physical Lab., New Delhi, India). Nuovo cimento (10) 8, 407-16(1958) May 1.

It is noted that if the elementary particles are described by nonlocal fields then the principle of conservation of parity is regained. A modified form of a previous model of the internal co-ordinate wave equation is shown to give satisfactory agreement with the observed mass spectrum, decays, and cross sections of the seven known unstable particles, and it predicts the occurrence of more heavy unstable particles. Then a simple one dimensional model is constructed, and it gives the same mass spectrum as before and the original Pais selection rules. (auth)

13400

ESTIMATE OF Λ-NUCLEON POTENTIAL WITH HARD CORE FROM THE BINDING ENERGY OF HYPERTRITON. D. B. Lichtenberg (Univ. of Hamburg). Nuovo cimento (10) 8, 463-70(1958) May 1.

A variational calculation of the binding energy of hypertriton is made in order to determine the strength of a Λ-nucleon potential with an infinite repulsive core. A hard core potential is also used to describe the proton-neutron interaction. A Λ-nucleon potential is found which is stronger than the Λ-nucleon potential determined from previous calculations which assumed monotonically varying potentials. Nevertheless, the Λ-nucleon potential still does not appear to be strong enough to bind the hyperdeuteron. Tensor forces are omitted in the calculation, but an argument is given to shown that their omission should not substantially affect the results. (auth)

13401

ON THE NUCLEON-ANTINUCLEON INTERACTIONS. M. Gourdin, B. Jancovici, and L. Verlet (Univ. of Paris). Nuovo cimento (10) 8, 485-96(1958) May 1.

In order to fit the experimental large total cross sections and small elastic cross sections, it is necessary to utilize a real potential of moderate strength, but a long range (at least around $\hbar/\mu c$) imaginary potential. This last requirement could perhaps be met in a model inspired by the fixed source meson theory, but improved so as to take also into account annihilation effects. Since the total cross-section is in first approximation proportional to the depth for an imaginary potential (instead of the square of the depth as for a real potential), a relatively small imaginary potential alone would be enough to produce a large total cross section. It is much more difficult to obtain a real potential which would be sufficiently small. The straightforward extension of the Gartenhaus potential to the nucleon-antinucleon system predicts a too large real potential. If additional annihilation-type graphs do not provide the destructive interference needed for obtaining a smaller real potential, it will appear difficult to keep the spirit of the fixed source meson theory for the nucleon-antinucleon interaction, even in the relatively low energy domain which was considered here. The necessity of a resort to the relativistic theory seems more and more difficult to discard. (auth)

13402

ON HIGH ENERGY PHOTONEUTRONS. A. Agodi (Instituto di Fisica dell' Universita, Catania, Italy). Nuovo cimento (10) 8, 516-18(1958) May 1.

An attempt is made to understand the new features of the photoeffect in the frame of Wilkinson's theory with the additional hypothesis that directly photoemitted nucleons have to be observed, on the average, with the energy of the virtual shell model state whose properties their motion shares just before they leave the nucleus. The further assumption is suggested that the virtual level spectrum has the same features of the shell model one. (A.C.)

13403

LARGE-ANGLE ELECTRON PAIR PRODUCTION FROM HYDROGEN. Burton Richter (Stanford Univ., Calif.). Phys. Rev. Letters 1, 114-16(1958) Aug. 1.

Positrons of 70-Mev energy produced in a liquid hydrogen target are detected at 90° to a 137-Mev peak energy bremsstrahlung beam made by passing an electron beam through a tantalum radiator. The positrons are momentum analyzed by a double-focusing magnetic spectrometer and detected by two plexiglas Cherenkov counters in coincidence. (W.D.M.)

13404

NUCLEON MAGNETIC MOMENT IN CUT-OFF MESON THEORY. S. K. Kundu (Indian Association for the Cultivation of Science, Calcutta). Proc. Phys. Soc. (London) 72, 49-52(1958) July.

The effect of nucleon current contribution to nucleon magnetic moment is considered up to the fourth order of the coupling constant in the cut-off meson theory using the renormalization procedure as developed by Chew. The same parameters as employed to fit the meson–nucleon scattering data have been used. It is found that the additional contribution due to this effect improves the previous theoretical results where only the mesonic current contribution has been taken into account. (auth)

13405

THE OPTICAL MODEL AT LOW ENERGIES AND DISPERSION THEORY. G. E. Brown (Univ. of Birmingham,

Eng.) and C. T. De Dominicis (Centre d'Etudes Nucleares de Saclay, France). Proc. Phys. Soc. (London) 72, 70-80(1958) July.

Neutron scattering in the low energy region where the compound levels are well separated is considered in detail. It is shown that the average phase can be reproduced by that calculated from a complex potential. The imaginary part of this potential is simply related to the absorption out of the incident beam into compound states. Formulas for the average behavior of various quantities are derived in a simple and straightforward fashion. (auth)

13406

COLLECTIVE MOTION IN THE NUCLEAR SHELL MODEL. II. THE INTRODUCTION OF INTRINSIC WAVE-FUNCTIONS. J. P. Elliott (Univ. of Rochester, New York). Proc. Roy. Soc. (London) A245, 562-81 (1958) July 8.

The wave functions for a number of particles in a degenerate oscillator level are expressed as integrals of the Hill-Wheeler type over intrinsic states. The rotational band structure which appeared in the classification is now understood, since all states of a band are shown to involve the same intrinsic state in the integral. It is possible to use the quantum number K of the intrinsic states as an additional label for the final wave functions, thus distinguishing states which have the same values for all other quantum numbers used. The integral form for the wave functions enables simple expressions to be obtained for the quadrupole moments which resemble those of the rotational model for a permanent deformation. (auth)

13407

OPTICAL MODEL OF ATOMIC NUCLEUS. Janusz Dabrowski. Postepy Fiz. 7, No. 4, 265-88(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5930.)

13408

CONCERNING THE THEORY OF THE DEUTERON SPLITTING REACTION. A. I. Akhiyezer and A. G. Setenko. Uchinye Zapiski Khar'kovskii Univ. 64, 9-12 (1955). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6057.)

If the change in the momentum of a deuteron is sufficiently large, as a result of diffraction scattering of rapid deuterons by a nucleus, deuteron splitting is possible. The cross section of the diffraction splitting is approximately πRR_d, i.e., of the same order as the cross section of the deuteron breakup, observed by Serber (72, 1008(1947)). By use of the well-known expression for the reaction amplitude the cross section for diffraction splitting is obtained. The energy and angle distribution of the escaping particles have the same character as in the case of a stripping reaction.

13409

QUASI-UNIDIMENSIONAL INTERPRETATION OF THE HYDRODYNAMIC THEORY OF MULTIPLE PARTICLE PRODUCTION. T. L. Rozental' (Physics Inst. of the Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 31, No. 2, 278-87(1956). Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8642.)

An investigation is made of a variant of hydrodynamic theory of multiple particle production in which the hydrodynamic stage is limited to unidimensional motion. By use of an approximate solution of the fundamental system of relativistic hydrodynamic equations and the method of successive approximations, it is possible to show that a one-dimensional approximation gives a good result all the way to final temperatures $T_k \sim$ (1.5 to 2) $\mu c^2/k$ (μ is the mass of the pion and k is the Boltzmann constant). The use of a unidimensional approximation made it possible to analyze relatively simply the dependence of certain characteristics (for example the energy) of interaction of high energy particles on the parameters of the theory (initial volume, final temperature). Comparison of the theoretical and experimental data leads to the conclusion that $T_k \sim c^2/k$; this leads to a tentative deduction that at this temperature the cross section of the interaction of secondary particles (apparently pions) is of the same order as the geometrical cross section.

13410

CONCERNING AN EXPERIMENTAL VERIFICATION OF THE THERMODYNAMICAL THEORY OF SPIN-SPIN PARAMAGNETIC RELAXATION IN PARALLEL FIELDS. K. P. Sitnikov (Kazan State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1093-5(1958) May. (In Russian)

Paramagnetic spin-spin absorption in a number of substances at a frequency $\nu = 600$ Mc at room temperature was studied experimentally. The absorption law in the Shaposhnikov theory agrees with the experiments when the corresponding relaxation time is considered to be independent of the magnitude of the constant field. The constant b/c was measured for some substances for which it previously has not been known. (tr-auth)

13411

TWO-PHOTON ANNIHILATION OF POSITRONIUM IN THE P-STATE. A. I. Alekseev (Moscow Inst. of Engineering Physics). Zhur. Eksptl'. i Teoret. Fiz. 34, 1195-1201(1958) May. (In Russian)

A relativistically invariant expression for the probability amplitude of two-photon annihilation of positronium was obtained by summation of an infinite number of graphs of a certain class. The probability of two-photon annihilation of positronium in the S- and P-states and also the selection rules for these processes were computed in the nonrelativistic limit. (tr-auth)

13412

SEMI-PHENOMENOLOGICAL THEORY OF NUCLEON-NUCLEON INTERACTION. G. F. Zharkov (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1211-20(1958) May. (In Russian)

Calculations of nucleon-nucleon interaction potentials were made within the framework of the semi-phenomenological isobar theory. The computed deuteron parameters and scattering of low energy nucleons agree with experimental data. No success was encountered when the computed potentials were employed to describe the scattering of high energy nucleons (~100 Mev). (tr-auth)

13413

RELATIVISTIC THEORY OF REACTIONS INVOLVING POLARIZED PARTICLES. Chou Kuang-chao and M. I. Shirokov (Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1230-9(1958) May. (In Russian)

It is shown that the relativistic formulas for the angular distribution, polarization vectors and tensors of reactions of the a + b → c + d type in the rest system are essentially the same as the nonrelativistic formulas if the particle spin is defined as the internal angular momentum of the particle with respect to its center of mass. The square of this intrinsic angular momentum is a Lorentz invariant. The particle spins are arbitrary, their rest masses are not equal to zero. The main difference from the nonrelativistic case is that the description of the spin state is not the same in different

Lorentz systems. Therefore, for cascade reactions (such as in experiments on double scattering), corrections must be introduced in the nonrelativistic formal theory. The relativistic modifications in the angular correlations for cascades of the type $\pi + p \rightarrow Y + KY \rightarrow N + \pi$ are indicated. (tr-auth)

13414

SOME NEW MAGIC NUMBERS FOR NUCLEONS. I. A. Vaisman. Zhur. Eksptl'. i Teoret. Fiz. 34, 1325-7(1958) May. (In Russian)

It is shown that configuration with 30 neutrons, and 42 or 60 protons or neutrons possess some "magic" properties. These configurations do not coincide with the shell configurations and their stability could be quite different from the closed shell terms. (R.V.J.)

Nuclear Properties

13415 HW-30128

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

THE RATIO OF PLUTONIUM 239 TO URANIUM 235 FISSION CROSS SECTIONS FROM 0.020 TO 1.0 ELECTRON VOLTS. B. R. Leonard, Jr., S. M. Hauser, and E. J. Seppi. Dec. 1, 1953. Decl. Aug. 4, 1958. 29p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

Foils of Pu^{239} and U^{235} were mounted back to back in a dual ionization fission chamber in the diffracted beam of the Hanford neutron crystal spectrometer. Results are presented graphically. (W.D.M.)

13416

CHARGE DISTRIBUTION IN THE NUCLEUS AND COMPARISON WITH CORRESPONDING EXPERIMENTS. Khan'-chzhao Lyu. Acta Phys. Sinica 12, No. 2, 177-81 (1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5933.)

13417

MEASUREMENT OF THE AVERAGE QUANTITY OF NEUTRONS EMITTED PER SINGLE CAPTURE, ν_{eff} FOR SPECIMENS OF Pu^{239} WITH ADMIXTURE OF THE Pu^{240} ISOTOPE AND MEASUREMENT OF THE EFFECTIVE RESONANCE INTEGRAL OF THE CAPTURE OF Pu^{240}. B. G. Yerozolimskiy, I. Ye. Kutikov, Yu. P. Dibrynin, et al. Atomnaya Energ. No. 3, 27-30(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8807.)

ν_{eff} was measured for specimens of Pu^{239} with addition of various quantities of Pu^{240} in the vicinity of the Fermi spectrum with a left boundary of 0.15 (gadolinium filter) and 0.4 ev (cadmium filter) for two series of specimens containing the following additions of Pu^{240} (in %): 0, 1.5, 2.5, 6.5, and 16. The Pu^{240} content was determined in one specimen by measuring the number of spontaneous fissions in a multi-layer ionization chamber; in other specimens the relative amount of Pu^{240} was determined by comparing the areas of the dips in the resonance of Pu^{240} at 1.06 ev on the transmission curves, obtained by means of a mechanical neutron selector. The procedure for determining ν_{eff} is based on the measurement of the effect of the capture and production of neutrons from the disturbance to the neutron field in a graphite prism with a central cavity, in which the investigated specimen is placed. The ratios ν''_{eff}/ν'_{eff} of specimens with and without Pu^{240} admixtures were measured. The results of the measurements are given. The resonance integral of absorption of Pu^{240} is $\Sigma_{240} = (9{,}000 \pm 3{,}000) \times 10^{-24}$ cm^2.

13418

EXTRANUCLEAR EFFECTS WITH FAST RECOILING NUCLEI. P. B. Treacy (Australian National Univ., Canberra). Australian J. Phys. 10, 373-7(1957).

Experimental results are given on angular distributions in the reaction $F^{19}(p,p'\gamma)$ proceeding via the second excited state of F^{19}, with targets in different physical and chemical states. It is noted that effects of extranuclear interactions in flight, in solid or liquid media, should be negligible. Tentative information is obtained about the fate of recoil nuclei in the solids NaF and CaF_2. The interpretation is consistent with some effects observed in α-γ angular correlations from Am^{241} in solid sources. (auth).

13419

THE NUCLEAR ABSORPTION OF X-RAYS BY OXYGEN. A. K. M. Siddiq and R. N. H. Haslam (Univ. of Saskatchewan, Can.). Can. J. Phys. 36, 963-76(1958) July.

The total x ray attenuation ratio in water was measured as a function of energy in the region 15 to 25 Mev, with a view to studying the nuclear absorption process in oxygen. The known energy response characteristics of several "activity detectors" ($Zn^{64}(\gamma,n)Zn^{63}$, $C^{12}(\gamma,n)C^{11}$, $S^{32}(\gamma,d)P^{30}$, $O^{16}(\gamma,n)O^{15}$) to bremsstrahlung were employed in these measurements. The experimental values of the attenuation ratios were compared to the predicted values calculated on the basis of various assumptions concerning the nuclear absorption process. The best description of the nuclear absorption process in oxygen appears to be continuous absorption on which relatively small absorption peaks are superimposed. (auth)

13420

RADIATION OF Tb^{160}. M. P. Avotina, E. P. Grigor'ev, A. V. Zolotavin, and B. Kratsik (Zhdanov Leningrad State Univ.). Doklady Akad. Nauk S.S.S.R. 119, 1127-30 (1958) Apr. 21. (In Russian)

Measurements of β spectra, conversion electron and photoelectron spectra, for Tb^{160} (prepared from chemically pure Tb_2O_3 bombarded by slow neutrons) were made with a double focusing $\pi\sqrt{2}$ angle spectrometer with a relative halfwidth line of 0.5%. The obtained data are tabulated and plotted. (R.V.J.)

13421

Cm^{242} α-DECAY. L. N. Kondrat'ev, V. B. Dedov, and L. L. Gol'din. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 99-100(1958) Feb. (In Russian)

Experimental measurements were made of the α decay energies for non-spherical nuclei at the second excitation level 4^+, and the results were compared with the theoretical values. The values were not in agreement for Cm^{242} and Cm^{244}, and it is shown that the discrepancy is real. The α levels are tabulated. (R.V.J.)

13422

Tb^{160} AND Ho^{160} DECAY AND Dy^{160} LEVEL SCHEMES. E. P. Grigor'ev, B. S. Dzhelepov, et al. (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 101-25(1958) Feb. (In Russian)

Radioactive Tb^{160} was prepared by slow neutron irradiation of chemically pure (99.99%) Tb_2O_3. Beta, conversion electron, and photoelectron spectra were studied on a double-focusing β spectrometer with halfwidth line 0.3 to 0.6%. Beta and conversion spectra of Tb^{160} are shown. Tb^{160} γ rays at 880 and 963–966 kev (Th target) are also shown. Radioactive Ho^{160} was prepared by irradiation of a tantalum target with 660-Mev protons, with chromatographic recovery of erbium and holmium fractions. The conversion spectra were studied on the same double focusing spectrometer with

half-width line 0.3%. Some areas of Ho^{160} conversion spectra are presented graphically (lines L_{I+II}, L_{III}, M, and N of isomeric transitions in Ho^{160} with $h\nu = 60.0$ kev and doublets 8.731–879.9 kev and 963.4–966.6 kev). The multiplicities of the Dy^{160} transitions were determined from the magnitudes of the relative conversion coefficients K: L and L_I: L_{II}: L_{III} in Tb^{160} and Ho^{160} conversion electron spectra and from the magnitudes of absolute conversion coefficients which are obtained in the Tb^{160} decay. The scheme of Dy^{160} levels was developed, and the facts supporting and contradicting the proposed scheme are enumerated and discussed. (R.V.J.)

13423

CONVERSION ELECTRON SPECTRA OF DYSPROSIUM FRACTION. B. S. Dzhelepov, B. K. Preobrazhenskii, I. M. Rogachev, and P. A. Tishkin (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 126-34(1958) Feb. (In Russian)

Conversion spectra of neutron-sufficient isotopes of dysprosium were investigated. The dysprosium fraction was recovered chromatographically from a tantalum target bombarded by fast protons. In addition to the expected radioactive species (Dy^{157}, T = 8.2 hr, γ = 177 and 325 kev; Dy^{159}, T = 134 days, pure K capture; and Tb^{157}, T = 4.7 days, γ = 1400 kev), new energy lines in the conversion spectra were observed with periods of 7.5 to 11 hr, 38 hr, and 4.7 days. It was assumed that various Dy isotopes with periods above 4 hr with subsequent formation of daughter Tb isotopes appear in Ta spallation. The investigated materials were grouped by their half-life periods. A decay scheme for Tb^{155} and a proposed decay scheme for Tb^{157} are included. (R.V.J.)

13424

CONVERSION ELECTRON SPECTRA OF Gd^{151} AND Gd^{153}. N. M. Anton'eva, A. A. Bashilov, B. S. Dzhelepov, and B. K. Preobrazhenskii (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 135-52(1958) Feb. (In Russian)

Conversion spectra of long-period gadolinium isotopes obtained after an extensive irradiation of a tantalum target in a scattered proton beam at 660 Mev were studied. First the chemical method was employed to recover the rare-earth fraction; this was followed by the chromatographic recovery of the pure gadolinium fraction containing mostly neutron-deficient isotopes, decaying with electron capture or positron emission. The studies were carried out with a magnetic spectrometer with resolving power 0.5%. The film on the counter window let in electrons with energies above 7 kev. The spectra were measured after a month of target irradiation and several times during the following year. It was found that the slowly changing area of the conversion spectrum was related to Gd^{153} and Gd^{151}. The decay scheme of $Gd^{153} \rightarrow Eu^{153}$, two variations of $Gd^{151} \rightarrow Eu^{151}$, and the Coulomb excitation and decay scheme of $Sm^{151} \rightarrow Eu^{151}$ are presented. (R.V.J.)

13425

DECAY OF $Nd^{140} \rightarrow Pr^{140}$–$Ce^{140}$. K. Ya. Gromov, B. S. Dzhelepov, A. G. Dmitriev, and B. K. Preobrazhenskii (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 153-7(1958) Feb. (In Russian)

The yield of Auger electrons of K series e_K/K_Σ (where e_K is the number of Auger electrons, K_Σ is the number of K captures per decay of Nd^{140} and Pr^{140}) was calculated. The results $\beta^+/K_\Sigma = 0.55$ agree within the experimental error (~30 to 40%) with the results expected for the chain of $Nd^{140} \rightarrow Pr^{140} \rightarrow Ce^{140}$. (R.V.J.)

13426

PROPERTIES OF FORBIDDEN β TRANSITIONS IN DEFORMED NUCLEI. Z. Bokhnatski (Inst. of Nuclear Research, Polish Academy of Sciences, Krakov). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 158-61(1958) Feb. (In Russian)

Probabilities of forbidden β transitions in deformed nuclei were calculated considering the influence of nondiagonal terms of the nuclear Hamiltonian in a strong bond representation. The K forbidden β^- decay of nucleus with odd A and odd number of neutrons was analyzed. The nucleus was considered rigidly axially symmetric. The scheme for Er^{171} is presented. (R.V.J.)

13427

ON THE THEORY OF INTERNAL CONVERSION. I. V. A. Krutov (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 162-70(1958) Feb. (In Russian)

The general theory of internal conversion is studied. The maximum approximations in the perturbation theory are discussed, and some consequences resulting from the general theory are described. (R.V.J.)

13428

ON THE INTERNAL CONVERSION THEORY. II. V. A. Krutov and K. Myuller (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 171-5(1958) Feb. (In Russian)

Formulas were derived for the correction of maximum approximations, and the areas where corrections are substantial are evaluated. A detailed study of the K shell and single multiplicity was made to illustrate the magnitude of the effects connected with maximum approximations in perturbation theory. (R.V.J.)

13429

GAMMA SPECTRUM OF La^{140}. V. P. Prikhodtseva and Yu. V. Khol'nov (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 176-8(1958) Feb. (In Russian)

Results of two series of measurements on two different sources of La_2O_3, wt. ~ 2g, with initial activity near 1.5 are presented. The corrections for γ line energies and spectra and the new γ lines 868 and 2343 kev are discussed. (R.V.J.)

13430

CONVERSION SPECTRUM OF La^{140}. A. A. Bashilov, B. S. Dzhelepov, N. D. Novosil'tseva, and L. S. Chervinskaya (Zhdanov Leningrad Inst. of Physics, Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 179-90(1958) Feb. (In Russian)

The conversion spectrum for the high specific activity La^{140} prepared from Ba^{140} (T = 12.8 days) was studied, and the quantum characteristics of transitions, spins, and parities were determined. Diagrams of the La^{140} β spectrum, conversion lines at low and high energies (320 to 490 and 700 to 930 kev), and the decay scheme of Ce^{140} are presented. (R.V.J.)

13431

PRECISION MEASUREMENTS OF SOME ENERGY LINES IN Ir^{192} AND $Eu^{152, 154}$ SPECTRA. V. A. Romanov (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 191-3(1958) Feb. (In Russian)

A prismatic beta spectrometer (with half-width line 0.04% and 1 × 10 mm source) was used for measurements of Ir^{192}, Eu^{152}, and Eu^{154} conversion lines. The K-line energies for transitions 296, 308, and 316 kev in the Ir^{192} spectrum were determined by comparing the positions of these lines with the lines I(E = 222.22 ±

0.03 kev) and J(E = 234.61 ± 0.03 kev). The energies of K−296 (E = 217.52 ± 0.03 kev), K−308 (E = 230.00 ± 0.03 kev), and K−316 (E = 238.06 ± 0.03 kev) were determined. The energy of K−374 (E = 300.54 ± 0.04 kev) was determined by measuring the energy distance between it and L_{II}−316. Measurements were made of Ir^{192} spectra for the energy difference in conversion lines from the Pt and Os subshells and from the Os K shell for transitions 201 and 205 kev. The prismatic β spectrometer (with half-width line 0.07%, and 1 × 10 mm source) was also used for measuring the energy distances between the lines L_{II}−136.33 ± 0.02 kev (conversion to Pt) in Ir^{194}, and M_{III}−122 kev (conversion to Sm) in Eu^{152} and Eu^{154} spectra. The results are compared with published data. (R.V.J.)

13432

SPECTRA OF DYSPROSIUM FRACTION POSITRONS. B. A. Dzhelepov, O. E. Kraft, B. K. Preobrazhenskii, and G. F. Yushkevich (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 208-10(1958) Feb. (In Russian)

The dysprosium fraction was recovered from a tantalum target bombarded by 660-Mev protons. Positron spectra were measured with a tripole focusing β spectrometer 9 hr after the separation. The spectra revealed a superposition of two spectra, the hard spectrum corresponding to a half life ~20 hr and a soft spectrum of 11 ± 2 hr half life. Data are plotted and a hypothetical decay scheme for Dy^{155} is presented. (R.V.J.)

13433

HARD γ RADIATION OF Na^{24}. L. V. Gustova, B. S. Dzhelepov, P. F. Ermolov, and O. V. Chubinskii. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 211-15(1958) Feb. (In Russian)

A gamma hodoscope was employed in the investigation of Na^{24} γ radiation. The method and experimental apparatus are described in previous work by B. S. Dzhelepov (Izvest Akad. Nauk S.S.S.R. 21, 1580(1958)). Two groups of experiments were set up. The first dealt in detail with the energy of Na^{24} γ radiation at 3 to 5 Mev; the second was devoted to the determination of the intensity of the 3.85-Mev line in relation to the 2.75-Mev line (the latter is equal to 1 quantum per decay). The data are plotted, and the decay scheme with the derived energies is presented. (R.V.J.)

13434

DECAY SCHEMES OF SOME ODD-ODD DEFORMATION NUCLEI. L. K. Peker (Library of the Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 216-27(1958) Feb. (In Russian)

On the basis of existing experimental data for β and γ spectra, the level schemes were plotted for the deformed nuclei Gd^{154}, Gd^{156}, Er^{168}, W^{184}, W^{186}, U^{232}, and Pu^{240} The diagram of the energy level dependence on the number of neutrons and, consequently, on the parameter of deformation is included. (R.V.J.)

13435

PROPERTIES OF NUCLEI WITH SMALL PARAMETERS OF DEFORMATION. PROPERTIES OF Os^{190}. L. K. Peker (Library of the Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 228-31(1958) Feb. (In Russian)

The deformed nucleus Os^{190} (deformation $\beta \approx 0.15$) was studied to find the characteristic properties of ellipsoid nuclei. The scheme levels were plotted from experimental data on Os^{190}. Analysis of γ-vibration levels in deformed nuclei shows that for the Os^{190} and 2^+ level appears at 550 to 600 Mev. The data for Os^{190} were correlated with the generalized shell models. The dependence of relative intensities of γ transitions B(E2) to the $K = 0^+$, $I = 0^+$, and 2^+ levels on the deformation parameters of Sm^{152}, Dy^{160}, W^{182}, W^{186}, Os^{188}, and Os^{190} nuclei was analyzed. It was found that with diminishing deformations, experimental magnitudes increasingly deviate from the theoretical, and that the discrepancy reaches a maximum with Os^{190}. The data show that the assumptions used in the deformed nucleus theory cannot be justified on the basis of small parameter deformation nuclei of the Os^{190} type. (R.V.J.)

13436

NUCLEAR MAGNETIC RESONANCE EXPERIMENT ON METAL CADMIUM. II. Yoshika Masuda (Kobe Univ., Japan). J. Phys. Soc. Japan 13, 597-604(1958) June.

The spin-lattice relaxation time, T_1 and the spin-spin relaxation time, T_2, of the resonance line in metal cadmium were measured by use of a nuclear magnetic resonance technique. The contribution of p-character in the conduction electron to the relaxation was estimated. The line width was measured at a temperature between the room temperature and 250°C. It was shown that the exchange broadening between unlike spins underwent a motional narrowing. The inverse line width or spin-spin relaxation time, T_2, was interpreted in terms of the lattice diffusion theory. These analyses yielded for the coefficient of self-diffusion D the value 0.05 cm^2/sec exp (−17.6 kcal/mol-RT). (auth)

13437

NUCLEAR QUADRUPOLE RESONANCES IN ARSENIC AND ANTIMONY TRIHALIDES AND SULPHUR MOLECULAR ADDITION COMPOUNDS. Shizuko Ogawa (Ochanomizu Univ., Tokyo). J. Phys. Soc. Japan 13, 618-28(1958) June.

Nuclear quadrupole resonances of I, Br, Cl, As, and Sb isotopes in solids $AsCl_3$, $SbCl_3$, $SbBr_3$, AsI_3, SbI_3, $AsI_3 \cdot 3S_8$, $SbI_3 \cdot 3S_8$, SnI_4, $SnI_4 \cdot 2S_8$, and $SnI_4 \cdot 4S_8$ have been measured systematically. The newly obtained coupling constants eQq and asymmetry parameters n of the I^{127} resonances at 77°K are as follows: eQq = 1383.03, 1402.68 Mc: n = 0.002, 0.039 in $SnI_4 \cdot 2S_8$, eQq = 1364.3, 1368.3, 1405.0 Mc, and n = 0.00, 0.00, 0.03 in $SnI_4 \cdot 4S_8$. In $SnI_4 \cdot 4S_8$ an additional line was observed at 219.04 Mc corresponding to the first resonance. The second resonance of SbI_3 was at 254.637 Mc with eQq = 895.83 Mc and n = 0.565. Resonance frequencies of As^{75} in AsI_3 and $AsI_3 \cdot 3S_8$ at 77°K were 29.338 and 49.501 Mc, respectively. The first resonance of Sb^{121} in SbI_3 was 25.406 Mc at 77°K and the corresponding resonance in $SbI_3 \cdot 3S_8$ was 37.461 Mc at 297°K. $SbBr_3$ showed two crystal forms which gave Sb^{121} coupling constants of 319.920 and 316.02 Mc and asymmetry parameters of 0.082 and 0.182 at 304°K, respectively. On the Br resonances of $SbBr_3$ three resonance lines instead of two hitherto reported were observed in both crystal forms. Coupling constants of trihalides were compared with their chemical bond properties. The constants of AsI_3 and SbI_3 are different from those of other compounds, while their sulfur molecular addition compounds are in rather good agreement. AsI_3 showed positive temperature dependency for arsenic isotope as for the case of iodine isotope. (auth)

13438

HIGHER ORDER TRANSITIONS IN DOUBLE NUCLEAR RESONANCE EXPERIMENTS IN SOLIDS. N. Bloembergen (Harvard Univ., Cambridge, Mass.). J. Phys. Soc. Japan 13, 660(1958) June.

Attention is called to some higher order nuclear spin transitions whose existence has been recently

demonstrated in double resonance experiments in cesium halides. (W.D.M.)

13439

(β,γ) CIRCULAR POLARIZATION CORRELATION FOR Co^{60} and Na^{22}. H. Appel and H. Schopper (Physikalisches Institut, Erlangen, Germany) and S. D. Bloom (Univ. of California, Livermore). Phys. Rev. 109, 2211-12(1958) Mar. 15.

The β, γ circular polarization coefficients for Co^{60} and Na^{22} were determined. The results appear to be the most accurate indication that the nonconservation of parity and the noninvariance under charge conjugation are maximum. (T.R.H.)

13440

MEASUREMENT OF THE LONGITUDINAL POLARIZATION OF ELECTRONS EMITTED IN β-DECAY OF Tm^{170}, Lu^{177}, Au^{198}, Sm^{153}, Re^{186}, Sr^{90} AND Y^{90}. II. A. I. Alikhanov, G. P. Eliseev, and V. A. Lyubimov (Academy of Sciences). Zhur. Eksptl'. i Teoret. Fiz. 34, 1045-57(1958) May. (In Russian)

Longitudinal polarization of electrons of coulomb β transitions is measured for various values of the electron energy. For all investigated substances the magnitude of the longitudinal polarization was found equal to $-v/c$. The most probable relations between the interaction constants in β decays are $C_T = -C'_T$, $C_S = -C'_S$, $C_V = C'_V$, $C_A = C'_A$. (tr-auth)

13441

ON THE LOW EXCITATION (ROTATIONAL) LEVELS OF Th^{234}. A. P. Komar, G. A. Korolev, and G. E. Kocharov (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1345-6(1958) May. (In Russian)

The energy spectra of α particles from U^{230} was studied in an ionization. The obtained spectra for the basic group at 4.182 Mev and the decay scheme are presented. The α_2 group is assumed to correspond to the second level transition in Th^{234}; intensity (0.25±)%, energy level ~160 kev. The energy relation of the second and first levels coincide with theoretical values obtained by the generalized nuclear model. (R.V.J.)

13442

CROSS SECTIONS FOR INELASTIC SCATTERING OF 4.5 Mev DEUTERONS ON LIGHT NUCLEI. E. A. Romanovskii and G. F. Timushev (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1350-1(1958) May. (In Russian)

Measurements were made of the differential cross sections for inelastic scattering of deuterons with $E_d \sim 4$ to 4.5 Mev on Li^7, F^{19}, Na^{23}, Mg^{24}, and Al^{27}. (R.V.J.)

Nuclear Reactors

13443 AECU-3777

Nuclear Development Corp. of America, White Plains, N. Y.

THE SODIUM-COOLED, D_2O-MODERATED REACTOR (SDR). Status Report. Kurt Goldmann and Charles K. Leeper. [1958]. 18p. (SDR-645). $3.30(ph OTS); $2.40(mf OTS).

For presentation at the 1958 Nuclear Congress, Nuclear Science and Engineering Conference, March 17-21, 1958.

The experimental program was focused on the problems of containing the Na, of providing a barrier material with low neutron absorption cross section and an ability to withstand the action of hot Na, of developing an arrangement of this material which is mechanically adequate, and of demonstrating that an integrated barrier system can be safety operated under reactor temperature and pressure conditions. Possible barrier materials were subjected to hot Na jets. Stainless steel, Zr, and Al withstood the jet very well. The experimental arrangements of other tests are shown. (M.H.R.)

13444 AECU-3779

Division of Construction and Supply, AEC.

ENGINEERING STUDY ON UNDERGROUND CONSTRUCTION OF NUCLEAR POWER REACTORS. Christian Beck. Apr. 15, 1958. 37p. $6.30(ph OTS); $3.00(OTS).

The advantages, disadvantages, and cost of constructing a nuclear power reactor underground are outlined. Data on underground construction of hydroelectric plants, other structures, and underground reactor projects in Norway and Sweden are reviewed. A hypothetical underground Experimental Boiling Water Reactor design and sketch are given with cost estimates. (T.R.H.)

13445 AECU-3783

[Knolls Atomic Power Lab., Schenectady, N. Y.]

[THE D1G REACTOR PRESSURE VESSEL SPECIFICATION]: ORDERING DATA (KPE-3023). [May 1958]. 49p. $7.80(ph OTS); $3.30(mf OTS).

The specifications for the D1G reactor pressure vessel and accompanying insulation, shield tank, thermocouples, test heads, fixtures, tools, and repair parts are given. (T.R.H.)

13446 AECU-3790

General Electric Co., Schenectady, N. Y.

CALCULATION OF THE EMERGENCY COOLING PERFORMANCE OF THE SAR PRIMARY COOLANT SYSTEM USING THE IBM TYPE 650 DIGITAL COMPUTER. R. C. Larsen. July 16, 1956. 64p. (DF-56-AD-30). $10.80(ph OTS); $3.90(mf OTS).

An IBM type 650 digital computer program is presented for solving the heat transfer equations with variable flow that describe the emergency cooling of the SAR at ship attitudes of zero degrees list and trim and also for ship attitudes where one primary coolant loop stops flowing. (auth)

13447 AERE-N/R-121

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

DIVERGENCY DATA FOR GLEEP. C. N. Watson-Munroe. Aug. 22, 1947. Decl. July 24, 1958. 9p.

The methods employed for measuring neutron fluxes and estimating the critical radius for the Gleep (Graphite Low Energy Experimental Pile) are described. Descriptions of the methods of loading and details of the experimental data are given. (auth)

13448 AERE-N/R-131

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

A DETERMINATION OF THE LAPLACIANS IN GLEEP. D. J. Littler and J. C. C. Stewart. Sept. 16, 1947. Decl. July 24, 1958. 15p.

An attempt has been made to determine the laplacians in Gleep by exploring the thermal-neutron flux distribution with indium foils. The laplacian of the uranium metal-graphite lattice is 0.92 ± 0.04 m^{-2} and the laplacian of the uranium dioxide-graphite lattice is 0.66 ± 0.04 m^{-2}. (auth)

13449 ANL-5654
Argonne National Lab., Lemont, Ill.
RADIOGRAPHIC TECHNIQUES FOR INSPECTING EXPERIMENTAL BOILING WATER REACTOR FUEL ELEMENTS. W. J. McGonnagle and P. R. Gonzales. May 1958. 17p. Contract W-31-109-eng-38. $0.75 (OTS).

A method for measuring the cladding thickness on Experimental Boiling Water Reactor fuel plates was developed. The natural radioactivity of the core material was used as the basis for the method. The intensity of the beta radiation transmitted through the clad was measured. For the measurement of Zircaloy cladding in the range of 0 to 20 mils, this equipment gave a 10% change in the counting rate per mil change in thickness. All of the EBWR fuel plates were radiographed using commercial x-ray equipment. From the radiographs the thickness of the side and end clad could be measured. (auth)

13450 ANL-5850
Argonne National Lab., Lemont, Ill.
ANALYSES OF EXPERIMENTAL POWER-REACTIVITY FEEDBACK TRANSFER FUNCTIONS FOR A NATURAL CIRCULATION BOILING WATER REACTOR. J. A. DeShong, Jr. and W. C. Lipinski. July 1958. 53p. Contract W-31-109-eng-38. $1.50(OTS).

Experimental power-reactivity feedback transfer functions were calculated from the EBWR power transfer function measurements. A simplified model of the EBWR kinetics was developed, using an analog computer, and an analytic expression was obtained for the feedback function. The analytic solution was fitted to the experimental functions to obtain power coefficients and time constants for various modes of operation. These data were extrapolated, and a power transfer function was predicted for 40 Mw. The reactor function was measured and compared with the prediction. A stability study was carried out, using open loop transfer functions containing the experimental feedback functions. Extrapolation of the gain and phase margins indicated stability to at least 66 Mw. The reactor was successfully operated at 61.7 Mw following this, with power limited by the capacity of the feedwater pumps. The use of the simplified model for parameter studies is demonstrated by a series of calculations to evaluate the effect of heat transfer time constant on stability. (auth)

13451 ANL-5261
Argonne National Lab., Lemont, Ill.
PRELIMINARY HAZARD SUMMARY REPORT ON THE BOILING EXPERIMENTAL REACTOR (BER). J. M. West, C. A. Anderson, J. R. Dietrich, J. M. Harrer, A. S. Jameson, and Samuel Untermyer. May 1954. Decl. Aug. 5, 1958. 111p. Contract W-31-109-eng-38. $18.30(ph OTS); $6.00(mf OTS).

A preliminary evaluation of the hazards associated with a 20-Mw boiling reactor for the purpose of determining site requirements is presented. The Boiling Experimental Reactor design, safety features, and performance are given, and the surroundings of the site at Argonne National Laboratory are described. (T.R.H.)

13452 APEX-358
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
POISON RETENTION IN REACTOR FUSES. R. J. Spera and S. N. Stilwell. Aug. 1957. 17p. Contracts AF33(038)-21102 and AT(11-1)-171. $0.50(OTS).

Uniform distribution of boron powder in an annular nuclear fuse chamber was accomplished with a staggered arrangement of alternate layers of Refrasil or Fiberglas cloth and aluminum screen wire that increased in number from bottom to top of the fuse chamber. (auth)

13453 APEX-394
General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.
NEUTRON AND PHOTON TRANSPORT: PLANE, CYLINDER, SPHERE (DIGITAL COMPUTER PROGRAMS). B. H. Duane. July 31, 1957. 133p. (XDC-58-5-167). $21.30(ph OTS); $6.90(mf OTS).

Digital computer Program S constructs neutron and proton transport theory solutions having plane, cylindrical, or spherical symmetry. Lattice detail in geometry, energy, and momentum-angles is flexible. Anisotropic scattering-transfer is neglected. For aircraft nuclear propulsion applications, the initial version of the program developed as the Los Alamos SNG Neutron Code has been generalized to include the effects of time-delayed neutron or photon production and to provide the flux adjoint. The input consists of geometry, material concentrations, collision cross sections, scattering-transfer cross sections, fission multiplication cross sections, inverse period, Laplace-time-transform of fission production spectra, and Laplace-time-transform of fixed source distribution. The output includes reactivity, critical size, flux distribution, adjoint distribution, and power distribution. (auth)

13454 ASAE-S-4
American-Standard. Atomic Energy Div., Mountain View Calif.
STATUS AND FUTURE REQUIREMENTS FOR THE URANIUM-233 POWER REACTOR PROGRAM. D. R. Mash and A. Ottenberg. Dec. 11, 1957. Decl. July 9, 1958. 87p. Contract AT-(04-3)-109. $2.25(OTS).

The status of thorium and uranium-233 technology for power reactor applications is reviewed. In the areas of fuel cycle, reactor design and reactor operational problems, information was developed on current status of technology, current and planned research and development programs, need for additional research and development, and time schedule of required kilograms of U-233 over the next five years to carry out the research and development now being planned, and the further work believed desirable in the longer term. (auth)

13455 BAW-74
BAW-74-1
Babcock and Wilcox Co. Atomic Energy Div., Lynchburg, Va.
POOL TEST REACTOR HAZARDS EVALUATION. Final Report. May 1958. 14p. Supplement I. June 1958. 20p.

This report and supplement (BAW-74-1) were issued separately, but are cataloged as a unit.

The reactor and associated equipment are described. How safety checks are incorporated in the operational procedures is pointed out. Various accident possibilities are investigated and evaluated, and it is concluded that the reactor will not be a health hazard or a source of danger to laboratory personnel or to people in the surrounding area. (T.R.H.)

13456 BNL-491
Brookhaven National Lab., Upton, N. Y.
NUCLEAR ENGINEERING DEPARTMENT PROGRESS REPORT [FOR] OCTOBER 1–DECEMBER 31, 1957. F. Maslan, ed. 62p. $1.75(OTS).

Some data on the thermodynamic properties of the liquid Bi–Na system are presented. The partial molar excess free energy of mixing of $MgCl_2$ in the system $MgCl_2$–KCl is plotted. Results of the first $BiCl_3$ oxida-

tion experiment are given. The adsorption of I and Xe by various graphites was studied and results are given. In the Sulfex "F" Process, the dissolution of Zircaloy and fluoride (as fluosilicic acid) removal vs. time are shown. Liquid waste operations are summarized. The status of the thermal convection loops as of December 20, 1957 is tabulated. Bearing tests were run on Mo, Ta, Stellite 90, and TiC (1020 binder). Studies are presented on the solubility of U in Bi when fixed amounts of U, Zr, Mg, and fission products are added. Cracking in the Cu bus bars of the Cosmotron was studied. (For preceding period see BNL-477.) (M.H.R.)

13457 CF-57-8-6
Oak Ridge School of Reactor Technology, Tenn.
AN 80 MEGAWATT AQUEOUS HOMOGENEOUS BURNER REACTOR. Reactor Design and Feasibility Problem. R. H. Chapman, H. L. Collins, W. J. Dollard, D. Fieno, J. Hernandez-Fragoso, J. W. Miller, H. von Hollen, and C. V. Wheeler. Aug. 1957. 156p. $24.30(ph OTS); $7.50(mf OTS).

An 80 Mw aqueous homogeneous burner reactor suitable for producing 20 Mw of electricity at a remote location is described. The reactor fuel consists of a light water uranyl sulfate solution which acts as its own moderator and coolant. The uranium is highly enriched (93% U^{235}). The primary considerations for the design were simplicity and reliability of the components, automatic demand control and safe for any load change, full xenon override not required, possibility of construction within the immediate future, and economic operation not the controlling factor. Reasonably complete studies are presented for the reactor physics, safety, stability, chemistry, heat transfer, and operation of the system. (auth)

13458 CF-58-4-7
Oak Ridge National Lab., Tenn.
HIGH-FLUX REACTOR—MACHINE CALCULATION. W. K. Ergen. Apr. 15, 1958. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

By means of 2-group, 3-region calculations the following features are investigated for a flux-trap reactor: finite fuel-layer thickness, moderation in the fuel layer, diffusion constant of the fuel layer, reflector thickness, and flux-trap radius. A 31-group calculation was used to study simultaneously finite fuel-layer thickness, moderation in the fuel layer, and epithermal absorptions and fissions. The results obtained are very near those obtained for the idealized case in ORNL CF-58-1-4. (auth)

13459 CF-58-7-43
Oak Ridge National Lab., Tenn.
STEADY-STATE PRESSURE AND THERMAL STRESSES IN THE HRT PRESSURE VESSEL. R. D. Cheverton and E. R. Volk. July 15, 1958. 24p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The methods used to calculate the steady-state pressure and thermal stresses in the spherical portion of the HRT pressure vessel are presented. The stresses reported here were calculated using the methods considered most applicable at the present time. These methods yield stresses significantly greater than originally reported for the HRT because the calculated total heat generation rate in the vessel wall is greater, and its distribution is different. A comparison of two-region (D_2O reflector) and single-region operation is made, showing very little difference between them insofar as stresses are concerned. A limited amount of experimental heat balance data for the HRT vessel wall has been compared to the calculated values. Primarily on the bases of this comparison, recommendations are made concerning further procurement of experimental data. (auth)

13460 CF-58-7-48
Oak Ridge National Lab., Tenn.
ANALOG COMPUTER STUDY OF THE OPERATION OF THE GAS-COOLED LOOP ON THE OAK RIDGE RESEARCH REACTOR. F. P. Green, F. H. Neill, B. E. Short, and M. L. Winton. July 7, 1958. 53p. Contract [W-7405-eng-26]. $9.30(ph OTS); $3.60(mf OTS).

An analog computer study of the ORR gas-cooled loop was made. The effects on fuel and gas temperatures of changing gas (nitrogen) flow rates, turning the heater on and off, and inserting or removing the fuel were determined. It was found that the temperature of the sample, if fuel, could be raised more rapidly than it could be reduced, and that the temperature could be reduced faster with high rates of flow. All of the equations used in building up the computer are given, and some of them are derived. (auth)

13461 CF-58-7-64
Oak Ridge National Lab., Tenn.
SIMULATION OF THE ORSORT BUTTERMILK REACTOR, LOSS OF FUEL FLOW. C. S. Walker. July 18, 1958. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The study of the Oak Ridge School of Reactor Technology Buttermilk Reactor is continued with analog computer simulation of a loss of fuel flow incident. (T.R.H.)

13462 CF-58-7-85
Oak Ridge National Lab., Tenn.
THE EFFECT OF PLANT THERMAL EFFICIENCY ON THE COST OF NUCLEAR POWER. W. L. Albrecht. July 25, 1958. 14p. Contract [W-7405-eng-26]. $3.30 (ph OTS); $2.40(mf OTS).

Nuclear power cost is plotted versus thermal efficiency. The relationship is not limited to any particular reactor type and is applicable for any reactor system where steam is the working fluid for the turbo-generator. (T.R.H.)

13463 CF-58-7-86
Oak Ridge National Lab., Tenn.
EFFECT ON POWER COST OF SUBSTITUTING ALUMINUM FOR ZIRCONIUM FUEL CLADDING IN A BOILING WATER REACTOR. W. L. Albrecht. July 24, 1958. 7p. Contract [W-7405-Eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The substitution of Al-clad for Zr-clad fuel necessitates reducing the operating temperature. The amount of saving that must be made in fabrication and chemical reprocessing to overcome the cost of operating at reduced thermal efficiency is estimated for a boiling water reactor. (auth)

13464 CF-58-8-2
Oak Ridge National Lab., Tenn.
TRIP TO ALCO PRODUCTS, KAPL, COMBUSTION ENGINEERING CO. AND FT. BELVOIR (APPR). RE: COOLING WATER ACTIVITY BUILDUP IN PRESSURIZED WATER REACTORS. H. N. Culver. Aug. 1, 1958. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Several uncertainties associated with predicting activity levels in water-cooled reactors are discussed in connection with development of the Nuclear Merchant Ship Reactor (Maritime Pressurized Water Reactor). (T.R.H.)

13465 CF-58-8-4
Oak Ridge National Lab., Tenn.
TECHNICAL SCOPE OF GAS-COOLED REACTOR FUEL ELEMENT IRRADIATION PROGRAM. Aug. 1, 1958. 22p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A set of 55 experiments has been outlined to provide a minimum irradiation program for selection of UO_2, pellet geometry and fabrication techniques, and canning technology. These experiments fall into three categories: prototype units in which radial dimension and heat fluxes are close to proposed design values, but irradiation times are long; reduced-size prototype for accelerated tests in which most variables will be studied; and miniaturized pellet irradiation to obtain high burnup for fission gas release studies. Reactor space has been found generally available and several installations are now examining their capabilities to participate in the program. A tentative schedule has been drawn to illustrate the feasibility of the program. (auth)

13466 CRR-749
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
A STUDY OF THE 50 SHEATH FAILURES IN NRX FROM SEPTEMBER 1955 TO AUGUST 1957. J. F. Palmer and W. M. Barss. June 1958. 81p. (AECL-650). $1.50(AECL).

The relative efficiencies of the gaseous fission product, delayed neutron, and gamma activity monitors and the NRX pressure monitors for detecting sheath failure are described. The occurrence of failures of various types is described with particular reference to the ability of the sheath to avoid splitting. The effects of core fabrication and sheathing methods on cracking of the uranium cores are discussed. Fabrication and sheathing methods are recommended. (W.D.M.)

13467 DM-52
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
COST COMPARISONS FOR ENRICHED VERSUS NATURAL URANIUM FUEL AND FOR ZIRCONIUM VERSUS STAINLESS STEEL FUEL SHEATHING IN BIDIRECTIONAL SLUG FUELLED REACTORS. W. B. Lewis. June 23, 1958. 55p. (AECL-651). $1.50(AECL).

The study here presented centers on a large heavy-water-moderated and cooled reactor. It is shown that with good neutron economy and a fuel fabrication cost of $20/kg of uranium, a total fuelling cost of less than 1.1 mill/kwh should be attainable with uranium at $40/kg or 0.9 mill/kwh with uranium at $30/kg (excluding fabrication). The use of stainless steel fuel sheathing even if only 0.25 mm thick is shown to add 0.2 mill/kwh or more to the fuelling cost, even if the optimum enrichment is maintained. For a gas-cooled reactor the cost increase from the use of stainless steel is liable to be twice as much, even allowing a higher temperature for the gas that raises the thermal to electrical conversion efficiency from 25 to 36%. (auth)

13468 HW-49423
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PRODUCTION OF TEST COMPONENTS FOR THE PLUTONIUM RECYCLE REACTOR PROJECT. F. B. Quinlan and J. C. Tverberg. Mar. 29, 1957. Decl. Apr. 4, 1958. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Two types of power tubes were produced, one type a three-foot length of 2-S aluminum tubing, the other a ten-foot length of 304 stainless steel tubing. Two hundred forty pounds of the lead-tin alloy with a density of 10.2 g/cc was alloyed, cast, extruded, then formed in a pilling machine to final form. One hundred feet of $\frac{1}{8}$-inch aluminum welding rod was swaged to 0.080 inches to be used as spacing elements in the cluster type fuel elements. (W.L.H.)

13469 HW-55173
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM–ALUMINUM ALLOY CRITICALITY. Norman Ketzlach. Feb. 28, 1958. Decl. Apr. 25, 1958. 17p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Critical conditions were determined theoretically for water-moderated and unmoderated systems of plutonium oxides and fluorides as well as those of plutonium-aluminum alloy materials. Since there are no experimental data available, the results presented should be considered as estimates until their validity is verified by experiment. (auth)

13470 HW-56640-A2
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE PROGRAM. MONTHLY REPORT [FOR] JUNE 1958. F. W. Albaugh, L. P. Bupp, P. F. Gast, and W. H. Rees. July 15, 1958. 17p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Progress is reported briefly in development of fuel element materials, instrumentation, and mechanical equipment for the PRPR. (For preceding period see HW-56185 A2.) (W.L.H.)

13471 JENER-56
Joint Establishment for Nuclear Energy Research, Kjeller, Norway.
NEUTRON FLUX DISTRIBUTION IN AN AXIALLY FINITE ANNULAR GAP SURROUNDING A BLACK ROD. J. M. Döderlein. June 1958. 11p.

Calculations of the neutron flux distribution within cylindrical gaps surrounding "black" rods were performed previously. These calculations are based on the assumption of axially infinite rod and gap, and on a diffusion type angular flux distribution at the gap surface. Investigations regarding the influence of these assumptions on the flux distribution, and in particular on the values of the flux and gradient at the rod surface, were performed. The results regarding the assumption of infinite axial dimensions are presented. The formulas for the flux obtained involve integrals which can only be computed by numerical integration. Some measurements were performed in an attempt to verify the suitability of the theoretical model used. (M.H.R.)

13472 NAA-SR-Memo-2127
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
RESULTS OF PRELIMINARY SHIELD ANALYSIS FOR THE 45.5 MW OMR. D. S. Duncan. Aug. 1957. 62p. $10.80(ph OTS); $3.90(mf OTS).

The calculations for determination of the preliminary shield configuration for a 45.5-Mw organic moderated reactor steam plant to be used as a guide in preliminary design layouts are presented. (T.R.H.)

13473 NDA-14-26
Nuclear Development Associates, Inc., White Plains, N. Y.
NUCLEAR ANALYSIS OF A U-233 THERMAL BREEDER. Ira Pullman. Mar. 30, 1954. Decl. July 7, 1958. 19p.

Work performed under contract with The Detroit Edison Co. and the Dow Chemical Co.

A critical mass of 10 to 20 kg and a breeding ratio of about 1.0 have been calculated for a U^{233}-bismuth fueled and graphite moderated reactor. Breeding losses caused by a high U^{233} alpha in the intermediate energy region are shown to be significant. (W.D.M.)

13474 NDA-014-167
Nuclear Development Corp. of America, White Plains, N. Y.
DANGER COEFFICIENTS FOR THE ENRICO FERMI FAST BREEDER REACTOR. Carl Klahr. Sept. 3, 1957. 23p. For Atomic Power Development Associations, Inc. $3.30(ph OTS); $2.40(mf OTS).

Danger coefficients are presented for eleven materials of interest in the Fermi Fast Breeder Reactor—U^{235}, U^{238}, Pu^{239}, B^{10}, stainless steel, Na^{23}, C^{12}, Zr, Mo, and fission products. The reactor was mocked-up by one-dimensional spherical and cylindrical representations. Danger coefficients were calculated by perturbation theory, using the reactor period as the eigenvalue corresponding to a neutron lifetime of 1.5×10^{-7} sec. Calculations were also made using reactivity as the eigenvalue. Danger coefficients calculated by the two methods agree. (A.C.)

13475 NRL-5142
Naval Research Lab., Washington, D. C.
NAVAL RESEARCH LABORATORY RESEARCH REACTOR. PART V. EFFECTS OF AIR VOIDS AND FUEL-FREE REGIONS. K. W. Marlow, E. I. Nowstrup, and R. H. Vogt. Apr. 3, 1958. 20p.

Parts I through IV issued as NRL-4668, NRL-4729, NRL-5025, and NRL-5077, respectively.

The reactivity effects of air voids in the reflector and in the core of the NRL Research Reactor were measured for a number of typical reactor configurations. Six voids were used, ranging in size from a 2-ft cube in the reflector to a $1\frac{1}{8}$-in. cylindrical void in the core. All voids in the reflector required additional fuel to compensate for their presence; voids in the core required the removal of fuel. In all cases, the interposition of cadmium between the reflector voids and the reactor prevented large reactivity increases when the voids were flooded with water. Reactivity changes were measured by subcritical multiplication, by addition of fuel, and with calibrated rods. There was a systematic difference in the magnitude of the numerical results, depending on the method used, with the results of the subcritical multiplication method being of relatively high magnitude and of the calibrated rods low. The effects of replacing fuel at the center of the core by water, graphite, and beryllium oxide were also observed. (auth)

13476 ORNL-2545
Oak Ridge National Lab., Tenn.
CALCULATION OF THE PHOTONEUTRON FLUX IN THE WATER NEAR THE BULK SHIELDING REACTOR. G. deSaussure. July 29, 1958. 12p. Contract W-7405-eng-26. $0.50(OTS).

Previously published in ORNL-2389, p. 22 (Sept. 1, 1957).

The measurement of the gamma-ray dose rate at a distance 267 cm from the Bulk Shielding Reactor was used to estimate the photoneutron flux at that point. The resulting calculated flux was 1.65×10^{-5} neutron $\cdot w^{-1} \cdot sec^{-1} \cdot cm^{-2}$. This is to be compared with a measured value of the thermal-neutron flux of 1.58×10^{-5} neutron $\cdot w^{-1} \cdot sec^{-1} \cdot cm^{2}$, which is assumed to consist almost entirely of photoneutrons. (auth)

13477 SPM-305
France. Commissariat à l'Énergie Atomique, Paris.
APPLICATION DE LA FORMULE DE f AU CAS DE CELLULES A EAU LEGERE. (Application of the Formula of f to the Case of Cells with Light Water.) A. Amouyal and P. Benoist. July 24, 1957. 13p.

Addition to CEA-571.

A new method for the derivation of the ratio ϕ_m/ϕ_u is used to show that the formula of f proposed in CEA-571 is applicable to the case of cells with light water. (J.S.R.)

13478 TID-7553
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 247p. (NAA-SR-2600). $3.00(OTS).

Separate abstracts have been prepared on the following papers presented at the SRE-OMRE Forum, held at Los Angeles, California Feb. 12 and 13, 1958: Operating Experience With The SRE; Sourthern California Edison Company Steam Electric Plant Operation; SGR Component Development Technology; Sodium Reactor Materials; Operating Experience With The OMRE; The Consumers Public Power District Sodium Graphite Reactor; OMRE Research and Development Program; and Fuel–Scale OMR Plant. (W.L.H.)

13479 TID-7553(p.17-34)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
OPERATING EXPERIENCE WITH THE SRE. L. E. Glasgow. p.17-34 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 18p. (NAA-SR-2600 (p.17-34)).

The results of the dry subcritical experiment (extrapolated critical loading of approximately 22 fuel elements), the wet critical experiment (critical loading of 33 fuel elements at 350°F), and the low-power physics measurements are discussed. Data from engineering tests, including temperature distributions and results of transient tests, are presented, together with information on engineering improvements resulting from the tests. Experience obtained from power operation, with particular emphasis on items of interest for the operation and the maintenance of full-scale Sodium Graphite Reactor Plants, is described. Future plans for the experiment, operation of which has been quite encouraging thus far, are presented. (auth)

13480 TID-7553(p.35-56)
Southern California Edison Co., Los Angeles.
SOUTHERN CALIFORNIA EDISON COMPANY STEAM ELECTRIC PLANT OPERATION. A. C. Werden, Jr. p.35-56 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 22p. [NAA-SR-2600(p.35-56)).

The steam electric plant was initially placed in operation on July 12, 1957. It has since been operated intermittently for a total of over 300 hours during which period it has generated approximately 370,000 kilowatt hours. This operation was preliminary in character and was performed under subnormal design conditions as imposed by the reactor in order to study reactor performance at low temperature and power. The maximum output during these trial runs was 2000 kilowatts. The steam conditions were 480 psig and 630°F as compared to design values of 600 psig and 825°F. Allowing for

these non-design conditions, the operation was generally considered to be satisfactory and gave indication of improving as temperatures were increased. Operating start-up procedure as well as operating experience with the steam generator, together with the feed water condition problems, are presented. (auth)

13481 TID-7553(p.57-71)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
SGR COMPONENT DEVELOPMENT TECHNOLOGY. R. W. Dickinson. p.57-71 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 15p. (NAA-SR-2600(p.57-71)).

Specific examples of developments in pumps, valve configurations, and cold traps are noted. Experience with SRE leading to the development of these designs is discussed. Studies of alternate materials of construction for SGR systems are covered, with a brief summary of current results at this and other laboratories; prospects for the use of low-alloy steels are particularly noted. The status of sodium-heated steam generators is reviewed, and preliminary results from the operation of the "once through" steam generator as they affect the heat transfer system are noted. Developments in the method of cleaning sodium-filled cavities are discussed, noting an unusual procedure which has proved satisfactory in preliminary tests. Experiments in progress to determine the necessity for extensive cleaning procedures in sodium system construction are covered. A brief review of experiments under construction or planned for the immediate future is made. (auth)

13482 TID-7553(p.73-84)
Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
SODIUM REACTOR MATERIALS. R. L. Carter. p.73-84 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 12p. (NAA-SR-2600(p.73-84)).

For SRE moderator graphite, the thermal neutron cross section, thermal conductivity from 300° to 700°C, and extent and nature of gas evolution during early reactor operation have been determined, thus permitting prediction of behavior and specification of graphite for sodium graphite reactors. Studies of zirconium in contact with sodium of controlled degree of purity permit estimation of life of moderator cladding under various possible reactor operating conditions. Of crucial importance is the fatigue life which in turn depends on oxygen in oxide films and grain growth of zirconium and its alloys. Irradiation tests of dilute uranium alloy fuel material are reported. A Th-7.6%-U^{235} alloy has been selected for the second experimental loading of SRE. To meet the need for still higher temperatures, uranium oxide fuel elements are under development. (auth)

13483 TID-7553(p.85-105)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
THE CONSUMERS PUBLIC POWER DISTRICT SODIUM GRAPHITE REACTOR. R. L. Olson. p.85-105 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 21p. (NAA-SR-2600(p.85-105)).

A 75,000 electrical kilowatt sodium graphite reactor power plant is currently being designed for the Sheldon Station of CPPD. The plant will produce 800 psig, 825°F steam with reactor sodium temperatures of 945°F at the outlet and 609°F at the inlet. The design of the core and heat transfer system differ in detail from the SRE, although being essentially scale-ups of that unit. The graphite moderator will be clad in stainless steel, and the fuel elements will employ uranium dioxide. Three parallel primary-secondary loops will each serve evaporator-superheater assemblies. Each heat transfer loop is rated at 85 thermal megawatts. A component development program paralleling the engineering design of the plant is establishing fabrication techniques and is functionally testing prototypes of major components, such as the fuel elements, moderator assemblies, control rods, sodium system components, steam generators, and the fuel handling system. (auth)

13484 TID-7553(p.113-50)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
OPERATING EXPERIENCE WITH THE OMRE (MAY 1957—FEBRUARY 1958). C. A. Trilling. p.113-50 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 38p. (NAA-SR-2600(p.113-50)).

The critical assembly (critical loading of 20 fuel elements at 250°F), the loading of the fuel excess (11 fuel elements), and the post-critical measurements of physics parameters and control system effectiveness are discussed. Among the more significant results are the absence of significant flow and pressure coefficients of reactivity, a large negative void coefficient (approximately $-1.6 \times 10^{-4}\%/cm^3$ for voids between plates in a center fuel element), and a temperature coefficient which agrees closely with calculations. Data on coolant decomposition rates for the operating conditions to date are presented, together with the information of interest from an operating and maintenance standpoint. (auth)

13485 TID-7553(p.151-95)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
OMRE RESEARCH AND DEVELOPMENT PROGRAM. R. H. J. Gercke. p.151-95 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 45p. (NAA-SR-2600(p.151-95)).

This paper describes the research and development program related to the OMRE and discusses the available experimental information obtained to date. The physical properties of a number of coolants of interest have been determined as a variable of high-temperature radiation damage. Data are presented for density, viscosity, heat capacity, vapor pressure, hydrogen density, and melting point. Heat transfer characteristics of unirradiated polyphenyls have been studied in a laboratory loop. A general equation correlating all the experimental heat transfer data has been developed. High temperature runs with the several terphenyl mixtures at surface temperatures up to 985°F gave results which indicated no fouling of heat transfer surfaces. Purification by distillation has been studied using radiation damaged coolant. These studies indicate that the separation between undamaged coolant and polymeric decomposition products can be carried out successfully, employing this process. Two in-pile loops were operated at high temperatures to study the rate and the effects of radiation damage to the coolant under reactor conditions. The effect of coolant decomposition on the heat transfer coefficients has been determined. (auth)

13486 TID-7553(p.197-209)
[Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.]
FULL-SCALE OMR PLANT. E. F. Weisner. p.197-209 [of] PROCEEDINGS OF THE SRE-OMRE FORUM HELD AT LOS ANGELES, CALIFORNIA, FEBRUARY 12 AND 13, 1958. 13p. (NAA-SR-2600(p.197-209)).

The concept of the Organic Moderated Reactor is set forth and a description is given of a 12.5 megawatt electrical power plant employing such a reactor. This particular plant has steam conditions of 450 psia and 550°F with a flow of 162,000 lb/hr. The outlet organic temperature is 625°F. The fuel consists of 6200 kg of aluminum-clad uranium alloy enriched to 1.8 per cent U^{235}. The research and development program is discussed. Full-scale tests of various fuel element types, control-safety rods, and fuel handling techniques are in progress. Process systems such as residue handling, degasification, pressurization, purification, and steam generation are being studied. Corrosion tests and studies of physical properties of organics under varying conditions are being conducted on a continuing basis. (auth)

13487 USAFIT-TR-58-12
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
CONTAINMENT OF A NUCLEAR POWER EXCURSION IN THE AIR FORCE NUCLEAR ENGINEERING TEST REACTOR (thesis). Donald Henry Asire. Mar. 1958. 120p.

The maximum credible incident, due to a step increase in reactivity of four percent, is a power excursion of 1000 Mw-sec. Additional energy from an exothermic aluminum–water reaction within the core could conceivably cause a static pressure rise in the containment shell of as much as 16.5 psi. The static pressure rise will be preceded by shock wave formation, which is caused by rapid power excursion and energy release. Shock wave behavior in air, water, and solids is described with special emphasis on the reflection, transmission, and reinforcement at the various boundaries or interfaces. One-quarter scale model blast tests performed to verify the integrity of the original reactor containment design are described. (W.D.M.)

13488 WAPD-CTA(EDX)-265
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
RESULTS OF PWR HYDROSTATIC SEAL WELD TEST. E. M. Tatarzycki. May 18, 1956. 12p. Contract [AT-11-1-GEN-14]. $3.30(ph OTS); $2.40(mf OTS).

A hydrostatic pressure test on two PWR seal weld mockups was conducted for the purpose of evaluating the design of the ASME Pressure Vessel Code. Both mockups were tested to destruction; failures were recorded at pressures of 16,000 and 18,000 psi. The failure in each case resulted from a rupture in the motor tube wall immediately above the simulated stator. In addition, strains were measured on one of the mockups at pressures up to 15,000 psi. (W.L.H.)

13489 WAPD-CTA(EMD)-395
[Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.]
DESCRIPTION AND PERFORMANCE OF PROPOSED ALTERNATE PWR CORE NO. 1 CONTROL ROD DRIVE MECHANISM. Dan S. Jones. Dec. 22, 1955. 17p. Contract [AT-11-1-GEN-14]. $3.30(ph OTS); $2.40 (mf OTS).

Description and expected performance of the RN-30A two-arm collapsible rotor mechanism proposed as the alternate control drive mechanism for the PWR core 1 are presented. (W.L.H.)

13490 WAPD-CTA(EML)-426
[Westinghouse Electric Corp. Bettis Plant, Pittsburgh.]
FINAL REPORT ON PWR CORE 1 LEAD MECHANISM PERFORMANCE CHARACTERISTICS. Test Specification 550009. E. G. Shockey and Dan. S. Jones. [Sept. 27, 1957]. 14p. Contract [AT-11-1-GEN-14]. $3.30(ph OTS); $2.40(mf OTS).

The results of final tests on the lead mechanism of the Shippingport Pressurized Water Reactor control drive mechanism are presented. The tests show that the mechanism meets design requirements. (T.R.H.)

13491 WAPD-CTA(ME)-223
[Westinghouse Electric Corp.] Bettis Plant, Pittsburgh.
RE-EVALUATION OF CHROME PLATED HARDENED TYPE 410 STAINLESS STEEL FOR SLIP-ON STATOR TYPE MECHANISM MOTOR TUBE. R. G. Christman, M. A. Golik, S. A. Greenberg, H. L. Helmbrecht, K. Jakobson, H. J. Kaplan, H. F. Mason, G. R. McIndoe, E. Rau, P. N. Seran, H. P. Wanter, and M. O. Weaver. [Apr. 1958]. 54p. $9.30(ph OTS); $3.60(mf OTS).

The Submarine Thermal Reactor Mark I Core-3 utilizes hardened type 410 stainless steel as primary coolant pressure boundary material in the motor tubes of all control rod drive mechanisms. Stress corrosion data, other lab test data, and service performance data are reviewed, and the suitability of type-410 stainless steel for this application is re-evaluated. (T.R.H.)

13492 WAPD-CTA(MEE)-492 and Add.
[Westinghouse Electric Corp.] Bettis Plant, Pittsburgh.
CONFERENCE REPORT—MEETING ON MATERIALS FOR SLIP-ON STATOR TYPE MECHANISM MOTOR TUBES. M. A. Golik. Apr. 17, 1958. 11p. Addendum. 8p. $3.30(ph OTS); $2.40(mf OTS).

This report and addendum were issued separately, but are cataloged as unit.

A meeting was held on April 17, 1958, at the Bettis Plant to review materials data for the slip-on stator-type mechanism motor tubes. Results of this meeting are presented. (W.L.H.)

13493 WAPD-CTA(MEE)-512
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
STRESS CORROSION CRACKING OF 410 STAINLESS STEEL–MINIATURE MOTOR TUBE TEST PROGRAM. M. A. Golik. July 1, 1958. 8p. Project No. 65b17. Contract AT-11-1-Gen-14. $1.80(ph OTS); $1.80(mf OTS).

Stress corrosion cracking of chrome-plated hardened type 410 stainless steel tempered at 650°F in submarine reactor coolant water was investigated. Differences between laboratory testing conditions and actual service conditions of the control-rod drive mechanism motor tube make it necessary to redesign a new test specimen which more closely simulates motor tube geometry. (T.R.H.)

13494 WAPD-RM-182(Del.)
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
XENON AND SAMARIUM CONCENTRATIONS PRODUCED BY VARIOUS FLUX PROGRAMS. H. J. Kirk. June 1953. Decl. with deletions Mar. 7, 1957. 70p. Contract AT-11-1-GEN-14. $12.30(ph OTS); $4.50(mf OTS).

The effect of time variations of the flux on the Xe^{135} and Sm^{149} concentrations in a reactor is discussed in this paper. The large increase in poison concentration following a reduction of flux is given as a function of

time for various initial and final values of the flux. Graphs are provided from which the maximum xenon and samarium concentrations following a reduction of flux from any initial to any final value can be determined. For the special case of reduction to zero flux the effect of various initial conditions on the resulting xenon concentration is shown as a function of time. The reactivity required for criticality is given as a function of xenon concentration, samarium concentration, and reactor constants. Also, the effect of the spacial dependence of poison concentration on reactivity calculations is briefly discussed. The problem of maintaining criticality during the shutdown of a reactor which cannot override maximum poison concentration is investigated. The poison concentration produced by periodic time variations in the flux is determined as a function of time for various frequencies and amplitudes of oscillation. Also, the variation in poison concentration produced by an arbitrary flux problem is discussed briefly. Appendix I enables solution of the more general problem, that of xenon and samarium buildup from arbitrary initial concentrations. Appendix II discusses the problem of the time variations of poison concentrations produced by an increase of the flux level. (auth)

13495 WAPD-T-351

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

STEAM CHANNELS FOR SELF REGULATION OF PRESSURIZED WATER REACTORS. J. N. Grace, W. G. Roman, and R. P. Rose. [1956?]. 23p. $4.80(ph OTS); $2.70(mf OTS).

The results of a preliminary study of building inherent control into a pressurized water reactor, "steam rod" control, are presented. Steam rod control consists of partially confined channels in parallel with the coolant channels, but closed at the top. Forced convection flow does not occur through these partially enclosed chambers; hence, steam is generated. The design of the core is such that the system is supercritical when all these chambers are filled with water, and subcritical when they are all filled with steam. When criticality is achieved, all chambers contain some proportion of steam and water. The relative amounts of steam and water act as a control of reactivity. (W.L.H.)

13496 WAPD-T-445

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

CRITICALITY CONSIDERATIONS IN MANUFACTURE OF REACTOR FUELS. J. C. Clark. [1957]. 12p. $3.30(ph OTS); $2.40(mf OTS).

Prepared for presentation at the 18th Annual Meeting American Industrial Hygiene Association Radiation Session, St. Louis, April 22-26, 1957.

Whenever fissionable materials are processed, there is a possibility of accumulating a critical mass. This will be determined by several factors which include the enrichment of the fissionable material, the effect of reflectors, the effect of moderators, the shape of the process vessels, the density of fissionable material in the system, the effect of non-hydrogenous diluents, and neutron interaction between process vessels. Control of criticality hazards in the manufacture of reactor fuels is based upon the appropriate combination of these factors which provides a balance between adequate safety and minimum costs and which insures safety with a minimum of rules. (auth)

13497 WAPD-T-484

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

THE FABRICATION OF THE ZIRCALOY-2 COMPONENTS IN THE BLANKET REGION OF THE FIRST PWR CORE. J. Glatter, E. G. Schwartz, W. L. Frankhouser, and J. H. Eyler. June 30, 1958. 60p. Contract AT-11-1-GEN-14. $9.30(ph OTS); $3.60(mf OTS).

Presented at 1958 Annual Meeting, American Nuclear Society, Los Angeles, Calif., June 3, 1958.

The development and manufacture of both the fuel bearing and non-fuel bearing Zircaloy-2 components comprising the blanket of the first pressurized water reactor (PWR) core is described. Some of the problems encountered in development together with limited cost in information are given along with a description of the fabrication processes for each of the components. (W.L.H.)

13498 WAPD-TM-136

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

PRIMARY COOLANT SYSTEM ACTIVITIES DUE TO A BURST SOURCE OF FISSION PRODUCTS. P. W. Frank and B. D. O'Reilly. May 1958. 20p. Contract AT-11-1-GEN-14. $0.50(OTS).

A formal mathematical description of the time dependence of activity in the main coolant loop of a pressurized water reactor resulting from the discontinuous release of core contained fission products is developed. The description accounts for the deposition, re-solution, and demineralization of activities due to one, two, and three member mass chains. A description of the IBM-650 WOLONTIS Code No. S0168, which numerically evaluates the various activities discussed, is given in the appendix along with the input data and results for a pair of exemplifying problems. (auth)

13499 YAEC-89

Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.

MONTHLY PROGRESS REPORT FOR THE PERIOD JUNE 1 TO 30, 1958. I. H. Coen and R. W. Barbe. July 20, 1958. 15p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

Progress in the design and development of the Yankee Power Reactor is briefly reviewed. (For preceding period see YAEC-79.) (T.R.H.)

13500

AIMS AND PROBLEMS OF REACTORS. Eugene P. Wigner (Princeton Univ.). Acta Phys. Austriaca 11, 412-21(1958). (In German)

Reactors have been used chiefly in the past as auxiliaries for research. In the future it is expected that they will replace fossil energy sources. The future necessity for new energy sources was displayed, and the role of nuclear energy in this connection was investigated. The need for new energy sources is more pressing in Europe than in the United States. This justifies the interest of the European investigator in immediately realizable reactors and the preponderance of American interest in the more advanced types of breeders. (tr-auth)

13501

RESEARCH REACTORS. Gustav Ortner (Technische Hochschule, Vienna). Acta Phys. Austriaca 11, 422-33 (1958). (In German)

The various reactors for research purposes which are in use at the present time are discussed with respect to their neutron flux properties and other particulars such as temperature dependence of the reactivity and average life time of fission neutrons. Finally, some experiments on the safety problems of reactors are described. (tr-auth)

13502

POWER REACTORS. Sigvard Eklund (Aktiebolaget Atomenergi, Stockholm). Acta Phys. Austriaca 11, 434-51(1958). (In German)

The various power reactors planned or under construction in various countries and by various organizations are discussed. The Calder Hall Reactor, the Pressurized Water Reactor, and the R3 and Adam reactors in Sweden are specifically described. The cost factors in the utilization of power reactors are considered. (J.S.R.)

13503

THE METHODS OF USING FUELS IN A NUCLEAR POWER PROGRAMME INCLUDING SOME NOTES ON REACTOR TYPES AND USES. J. V. Dunworth (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Acta Phys. Austriaca 11, 452-70(1958).

A brief discussion is given of a few possible applications of nuclear heat. This is followed by a discussion of the initial steps in a nuclear energy program and the immediate United Kingdom reactor program. An explanation is given of the various ways of using nuclear fuels and of the quantities required. Finally, there are some comments on the more advanced aspects of reactor development and on some associated problems. The United Kingdom is building natural uranium, gas-cooled, graphite-moderated reactors and in addition has built a diffusion plant. It is now able to consider the many types of reactor which are possible once separated uranium-235 and plutonium are available. Future high output reactor developments seem likely to be associated with three distinct types of system. First, there is a thermal or near-thermal heterogeneous reactor in which a long-life fuel is used. It seems likely that chemical and metallurgical considerations as well as nuclear ones will favor the thorium–uranium-233 fuel cycle and that such a reactor will be about self-maintaining in fissile material. Initially, some of the reactors may well operate on a plutonium–uranium-238 fuel cycle. Secondly, there is a homogeneous type of reactor which seems likely to operate only on the thorium–uranium-233 fuel cycle and the aqueous system has a long lead at present. Finally, there is the fast or slightly moderated fast reactor which can lead to a very high gain factor using the plutonium–uranium fuel cycle, and rather lower ones using the thorium–uranium-233 cycle. In both cases some sacrifice of part or all of the gain factor is likely to ease engineering and processing problems and result in a more economic system and this could well be the method of emergence of an intermediate system. In this case, the indications are that the fuel cycle will be thorium–uranium-233 once again. (auth)

13504

BASIC PROBLEMS OF HEAT TRANSFER IN NUCLEAR REACTORS. Hans Dieter Baehr. AEG Mitt. 48, 1-11 (1958) Jan. (In German)

In nuclear reactors large heat fluxes must be removed at high coolant temperatures, without which the permissible temperatures in the reactor and in the fuel elements would be exceeded. Three problems arising from this factor are considered: heat conduction in the fuel elements, heat transfer to the coolant, and heat removal with the coolant from the reactor. After a comparison of coolants suitable for reactors, the heat transfer problems which occur in gas-cooled, water-cooled, organic liquid-cooled, and liquid metal-cooled reactors are discussed. (tr-auth)

13505

RESEARCH REACTOR ESTABLISHMENTS. Joachim Ehrentreich. AEG Mitt. 48, 11-23(1958) Jan. (In German)

Various research reactor types and their construction are described. The applicability and development of high-flux reactors for material testing are examined and discussed on the basis of plant and operating cost. Cooling and shielding problems are mentioned, and the special importance of the measuring and regulatory techniques in research reactors is indicated. Technical questions of construction and safety are discussed on the basis of examples of constructed and planned reactors. (tr-auth)

13506

THE COST STRUCTURE IN ATOMIC POWER STATIONS. Heinz Kornbichler. AEG Mitt. 48, 23-30(1958) Jan. (In German)

Formulas and estimations are given which might decide the cost structure of various reactor types. The calculated lowest kwh cost is certainly not valid for the first experimental power station; it is hoped that it will be obtained in the second or third station of the respective types. While the first nuclear power station must balance against the high investment cost a much greater annual operating cost, so that a cost displacement in favor of conventional power station will naturally occur, development will probably lead to cost lowering which will give nuclear power stations also the lowest annual operating cost. (tr-auth)

13507

RADIATION PROTECTION IN NUCLEAR REACTORS. Horst Karl-Friedrich Müller. AEG Mitt. 48, 38-47 (1958) Jan. (In German)

The use of atomic energy in power and research reactors requires safety precautions which remove risk of personal danger. A short survey is given of the problems of radiation protection. The fundamental processes in nuclear fission and the effect of gamma and neutron irradiation on materials are discussed. In connection with the biological effects some radiation units of measure and shielding materials are considered. By means of simple examples an outline of radiation protection calculations is presented. (tr-auth)

13508

NUCLEAR POWER STATIONS WITH LIGHT-WATER COOLED OR GAS COOLED REACTORS. Alfred Schuller. AEG Mitt. 48, 47-57(1958) Jan. (In German)

The measurements, weights, and plant costs of a nuclear power plant with water cooled and gas cooled reactors with a power of 100 Mw (el) are compared. The fuel supply, the enrichment, and the recovery of irradiated fuel elements are briefly described, and the analysis of the fuel costs as well as fuel efficiency is considered. The operating costs per kwh and future development to obtain higher live steam temperatures and therefore better efficiency are discussed. (tr-auth)

13509

SPECIAL FUEL DISTRIBUTIONS AND COOLING PROBLEMS IN REACTORS OF NUCLEAR ENERGY ROCKETS. F. Winterberg. Astronaut. Acta 4, 138-65(1958). (In German)

Special distributions of the heat production in reactors of nuclear energy rockets which allow the most favorable heat transfer, are discussed. The appropriate fuel distributions are calculated for some simple geometric conditions. Favorable fuel distributions are those that result in a constant density of expended energy in the core of the reactor, and those where the surface temperature of the cooling channels remains constant. (auth)

13510
REACTOR OF THE ATOMIC ELECTRIC STATION OF THE ACADEMY OF SCIENCES OF THE USSR. D. I. Blokhintsev, N. A. Dollekhal', and A. K. Krasin. Atomnaya Energ. No. 1, 10-23(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6104.)

The thermal power of the reactor is 30,000 kw, and the electric power is 5,000 kw. The amount of uranium charge is 550 kg, representing 27.5 kg U^{235} at a 5% enrichment. The moderator and reflector are made of graphite, and the coolant is ordinary distilled water. The thermal flux reaches 1.8×10^6 kcal-m^{-2}-hr^{-1}. The shield comprises a layer of water 100 cm thick and 3 meters of concrete. The graphite core of the reactor is three meters in diameter and 4.6 meters high. The central section contains 157 vertical holes at a spacing of 120 mm. 128 holes are occupied by the working elements, and the remainder are intended for the control rods and for auxiliary purposes. The diameter of the active zone is 1500 mm, the height is 1700 mm. Tubular uranium fuel elements are used in the reactor. The water pressure is 100 atmospheres and the temperature at the reactor output is 280°. The water of the coolant forms the primary loop, which contains a steam generator. The secondary loop comprises a turbine generator, operating on steam with a pressure of 4.5 atmospheres and a temperature of 270°. The atomic electric station of the Academy of Sciences of the USSR has been operating without interruption since June 27, 1954. Its operating experience has made it possible to proceed toward a design of more powerful stations with uranium–graphite reactors and water cooling.

13511
"AUCTIONEER" CONTROLS ATOMIC REACTOR COOLANT TEMPERATURE. H. A. Powers (Norwood Controls). Control Eng. 5, No. 7, 117, 119(1958) July.

The average coolant temperature in a pressurized-water reactor is an important parameter, and in a multiloop plant it is necessary that average temperature be obtained from the highest inlet and outlet temperatures. The design of a device to select the highest inlet and outlet temperatures and transmit these values to an averaging indicator and controller is described. Two such devices, called auctioneering units, are required per control system; they provide two electrical signals, one proportional to the hottest of the four hot-leg coolant temperatures, and one proportional to the hottest of the four cold-leg temperatures. The two voltages are averaged, and the resulting value compared with a manual preset temperature to provide the temperature error signal that eventually controls the position of the reactor rods. (J.R.D.)

13512
SHIPPINGPORT ATOMIC POWER STATION, RADIOACTIVE MATERIAL CONTROL. Jacques R. Lapointe and Robert D. Brown (Westinghouse Electric Corp., Pittsburgh). Ind. Eng. Chem. 50, 980-6(1958) July.

No fuel reprocessing facilities are planned for the nuclear power station at Shippingport, and because of the nature of the wastes, hazards and associated problems are considerably greater than those at a radiochemical processing plant. The disposal methods include ion exchange for liquid wastes, underground storage for solid wastes, and atmospheric dilution for gaseous wastes. A discussion of these methods is presented, along with a description of plant instrumentation. (J.R.D.)

13513
WATER TECHNOLOGY AT THE SHIPPINGPORT ATOMIC POWER STATION. S. F. Whirl and J. A. Tash (Duquesne Light Co., Pittsburgh). Ind. Eng. Chem. 50, 987-8(1958) July.

A general description of the Shippingport Atomic Power Station is presented in order to point out the role water plays in its operation. Purification and other treatment for water are described along with a discussion of the properties which the make-up water must have for use in both primary and secondary systems. Sampling and analysis of the in-stream primary system are described, and a discussion of canal water treatment for use as the neutron shield is included. (J.R.D.)

13514
ARMY PACKAGE POWER REACTOR WATER TREATMENT AND WASTE DISPOSAL. A. Louis Medin (Alco Products, Inc., Schenectady, N. Y.). Ind. Eng. Chem. 50, 989-90(1958) July.

The water in the primary system of the Army Package Power Reactor is maintained at high purity to minimize build-up of excessive radioactivity. This is accomplished by use of a bypass purification system with mixed-bed demineralizers. The use of type 304 stainless steel requires absolute minimum oxygen and chloride concentrations in the secondary system. Waste disposal systems and equipment are reduced by using a closed primary loop, so that no significant amount of primary water is discharged to the environment. (J.R.D.)

13515
HOW THEY ARE BUILDING NUCLEAR BRITAIN. Nigel Calder. New Scientist 4, 413-14, 16, 18(1958) July 17.

The progress and differing methods in the building of the Bradwell, Berkeley, Hunterston, and Hinkley Point power reactors are discussed. (W.D.M.)

13516
THE INSTRUMENTS THAT CONTROL NUCLEAR POWER PLANTS. Denis Taylor. New Scientist 4, 425-26, 28-9(1958) July 17.

The requirements of control instruments for nuclear power stations are discussed. Future developments aiming at simplification and instruments to rectify faults automatically without shutdown are reviewed. (W.D.M.)

13517
HEAT TRANSFER PROBLEMS IN REACTOR TECHNOLOGY. W. Junkermann. Nukleonik 1, 73-87(1958). (In German)

A survey is presented on heat transfer problems in reactors. The requirements for reactor coolants and possible structural materials for heat exchangers are indicated. The heat equations for various coolants are derived. Special properties of coolants such as air, water, and gases are described. Heat exchangers are classified, and their construction is described. Technological and corrosion problems for various reactor types are discussed. 28 references. (J.S.R.)

13518
INSTRUMENTATION OF POWER REACTORS. Alfred Decker. Siemens-Z. 32, 264-7(1958) May. (In German)

By the use of schematic representations, a survey is presented of the measuring, control, and safety instrumentation of a power reactor. The adaptation of the control equipment to reactor dynamics is briefly discussed. (tr-auth)

13519
CONTROL OF REACTORS IN POWER STATIONS. Dietrich v. Haebler and Herbert Trőscher. Siemens-Z. 32, 267-72(1958) May. (In German)

As an introduction the reactor control behavior which is dependent on the stabilizing effect of temperature is discussed. Several characteristics contribute to the limitation of inherent stability. The control characteristics of the reactor and the type of operation of the power station determine the type of control system. The range of load variation and the characteristics when operating under partial load may also be determined by the reactor. Examples are given of control systems for gas-cooled reactors, pressurized-water reactors with and without inherent stability, and boiling-water reactors. (tr-auth)

13520

THE EFFECT OF RATED VALUE ADJUSTERS IN REACTOR CONTROL CIRCUITS ON THE CONTROL ACCURACY AND CONTROL DYNAMICS. Erich Rolf, Klaus Anke, and Michael Belamin. Siemens-Z. 32, 273-9(1958) May. (In German)

In control circuits with a wide rated value range, the accuracy and dynamics of the control depend on the manner in which the rated value adjuster is connected into the circuit. This is particularly important for reactor control circuits. Some of the principle methods of inserting the rated value adjuster into the reactor control circuit are examined and the effect of its position on the design of the amplifiers is discussed. An experimental test with an analog computer, in which the reactor was simulated by means of R-C time-lag units, confirmed the theoretical results. (tr-auth)

13521

THE ARRANGEMENT OF RADIATION DETECTORS FOR THE CONTROL OF NUCLEAR REACTORS. Karl Janner. Siemens-Z. 32, 279-84(1958) May. (In German)

An illustration is given of the difficulties encountered in the arrangement of radiation detectors for the control of power reactors with pressure vessels and of the measures taken to overcome them. A description is given of the possibilities of determining the power from the radiation levels and of increasing the sensitivity and the n/γ ratio by arranging detectors outside the reactor vessel. (tr-auth)

13522

NEUTRON MEASURING CIRCUITS FOR REACTORS. Heinrich Kalusche. Siemens-Z. 32, 285-7(1958) May. (In German)

Measuring circuits for thermal neutrons are of decisive importance for the correct and reliable operation of a reactor, since reactor behavior is characterized by neutron balance. The flow of neutrons, as well as its variation with time, must be measured because these values are utilized in the supervisory, control, and safety systems. A description is given of both the logarithmic and the linear measuring circuits designed for an experimental reactor. (tr-auth)

13523

AN ELECTRICAL DRIVE FOR TRIMMING SHUT-OFF RODS IN A REACTOR. K. Berkl. Siemens-Z. 32, 384-5(1958) May. (In German)

A description is given of a new shim-rod drive for a research reactor. In the design, special consideration was given the fact that one drive must be placed between each four fuel elements and that the distances between the fuel elements would be determined by the physically defined dimensions of the lattice formed by the fuel and control elements of the reactor. (tr-auth)

13524

HEAT TRANSFER CHARACTERISTICS OF POLYPHENYL REACTOR COOLANTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 145, Session 20. M. Silberberg and D. A. Huber (Atomics International, Canoga Park, Calif.). New York, American Institute of Chemical Engineers, 1958. 29p.

In support of the Organic Moderated Reactor Experiment, heat transfer characteristics of several polyphenyls have been investigated in a laboratory heat transfer loop. Heat transfer runs were made with diphenyl, Santowax R (commercial mixture of terphenyl isomers), and a 2:1 mixture of Santowax O (commercial ortho-terphenyl) and Santowax M (commerical meta-terphenyl). The operating conditions were as follows: fluid temperatures, 480 to 770°F; heater surface temperatures, 565 to 875°F; fluid velocities, 5 to 25 ft/sec; heat fluxes, 40,000 to 290,000 Btu/hr-ft^2; and Reynolds number, 20,000 to 300,000. The heat transfer correlations obtained by a digital computer technique are discussed. No heat transfer surface fouling was observed after a 90-hour run at a maximum surface temperature of 985°F. (auth)

13525

TEMPERATURE MEASUREMENTS IN FRENCH NUCLEAR REACTORS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 151, Session 15. P. Jover and P. Belin (French Atomic Energy Commission). New York, American Institute of Chemical Engineers, 1958. 19p.

The importance of temperature measurements in nuclear reactors is reviewed, and problems raised by these measurements are discussed along with the solution of these problems at large-scale installations in France. It is pointed out that there is a need for temperature detectors which stand intense neutron fluxes, and for knowledge of the behavior of materials under irradiation and at high temperature. (J.R.D.)

13526

INSTRUMENTATION AND CONTROL OF FRENCH THERMAL REACTORS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 152, Session 21. P. Bonnaure (French Atomic Energy Commission, Saclay). New York, American Institute of Chemical Engineers, 1958. 35p.

A brief description is given of most of the apparatuses developed by the French C.E.A. to provide easier and safer control. Power and reactivity measurements, control loops, and burst-slug detectors are the main scopes of this presentation. (auth)

13527

NEW TECHNIQUES IN THE SIMULATION OF NUCLEAR PLANTS. Presented at Nuclear Engineering and Science Conference, held at Chicago, March 17 to 21, 1958. Preprint 153, Session 30. P. Braffort and C. Caillet (French Atomic Energy Commission, Saclay). New York, American Institute of Chemical Engineers, 1958. 31p.

The techniques used in simulating homogeneous and push-pull reactors and nuclear and thermonuclear plants are discussed, and examples are cited from studies carried out at the Analogue Calculation Laboratory at Saclay. It is pointed out that analog calculation techniques provide solutions to numerous reactor problems. (J.R.D.)

13528

ENGINEERING APPROACHES TO SOME MATERIALS PROBLEMS OF NUCLEAR POWER PLANTS. Presented at Nuclear Engineering and Science Conference,

held at Chicago, March 17 to 21, 1958. Preprint 188, Session 23. W. L. Fleischmann and S. L. Williams (General Electric Co., Schenectady, N. Y.). New York, American Institute of Chemical Engineers, 1958. 34p.

Because structural integrity, reliability, and accessibility are major objectives in the design of components of nuclear power plants, evaluation of mechanical properties in relation to the service requirements has received considerable attention. Specifically, the effect of fatigue in the range of plastic strains has been investigated. Also, impact test results are now used on a rational basis to limit low temperature operation. Various factors which help to improve the accessibility are discussed. The importance of low manganese and cobalt content are mentioned to achieve and maintain good accessibility adjacent to reactor vessels made of a special low alloy steel. The problem created by the presence of cobalt in stainless steel exposed to the primary coolant water is analyzed and a reasonable cobalt content of stainless steel for various major components is suggested by the studies presented here. The importance of piping layout to prevent localized deposition of radioactive corrosion products is illustrated by some examples. (auth)

Nuclear Transformation

13529 CF-58-7-122
Oak Ridge National Lab., Tenn.
BUILDUP AND DECAY FACTORS FOR MEMBERS OF THE U-232 DECAY CHAIN. E. D. Arnold. July 31, 1958. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Activity ratios for the important members of the U^{232} chain are presented in tabular form. These ratios are presented for initially pure U^{232}, initially pure Th^{228}, and initially pure Ra^{224}. (auth)

13530 DP-279
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
FORMATION OF U-232 DURING THE IRRADIATION OF THORIUM. Daniel S. St. John and Edward C. Toops. Apr. 1958. 19p. Contract AT(07-2)-1. $0.75(OTS).

The formation of U^{232} by (n,2n) reactions in pile-irradiated thorium is discussed. For thorium irradiated in a heterogeneous reactor, the total U^{232} formed is produced by fast neutrons from two sources: (a) those which originate in the surrounding fuel elements, and (b) those produced by the fissioning of U^{233} in the thorium itself. A Monte Carlo calculation is used to estimate the effective (n,2n) flux in heavy water or graphite surrounding a point source of fission neutrons. The results for the point source are integrated to give the effect of a line source or, approximately, a fuel rod. (auth)

13531 UCRL-5208
California. Univ., Livermore. Radiation Lab.
TABLES OF TWO U^{235} FISSION SPECTRA. R. J. Howerton, J. Bengston, and S. J. French. Oct. 1957. 5p. Contract W-7405-eng-48. $0.50(OTS).

The U^{235} fission spectrum is tabulated as a function of energy for two analytic representations. The table contains the distribution functions, their first derivatives, and their first integrals up to 10 Mev. (auth)

13532 UCRL-8215
California. Univ., Berkeley. Radiation Lab.
THE CROSS-SECTION OF THE REACTION $U^{234}(\alpha,4n)Pu^{234}$. Glen E. Gordon. Mar. 1958. 10p. Contract W-7405-eng-48. $0.50(OTS).

The cross section of the reaction $U^{234}(\alpha,4n)Pu^{234}$ was determined by the recoil technique, using the reaction $Pu^{239}(\alpha,3n)Cm^{240}$ to monitor the beam and to determine the recoil efficiency. The maximum in the cross section occurs at 42.6 Mev, where it is 0.98 ± 0.15 mb. (auth)

13533
NOTE ON THE $Li^6(d,\alpha)He^4$ REACTION. Jerzy Sawicki (Inst. of Theoretical Physics, Warsaw). Acta Phys. Polon. 15, No. 1, 71-3(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6059.)

A formula is derived for the angular distribution of the particles obtained from the $Li^6(d,\alpha)He^4$ reaction. It is proposed that the reaction has the character of field-induced emission, and a model for the Li nucleus as a system consisting of α particles and a deuteron is adopted. The Coulomb effects are disregarded, and the potential of the nuclear forces is assumed to be a rectangular potential well. The angular distribution of particles emitted by Li nuclei upon bombardment by 20-Mev deuterons is calculated. This distribution has a large maximum for approximately 40° and two minima for approximately 17° and 65°.

13534
A SIMPLE NUCLEAR MODEL FOR Li^7 AND ITS USE IN INVESTIGATING THE REACTION $Li^7(\gamma,H^3)He^4$. W. Czyz (Jagielonian Univ., Krakow, Poland). Acta Phys. Polon. 15, No. 2, 129-42(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8708.)

Li^7 is considered as a system consisting of an α particle and a tritium nucleus, where it is assumed that the potential of the interaction between them is in the form of a rectangular well of a depth depending on the moment of the relative motion. The radius of the potential was taken to be the same for all states and equal to $r_0 = 5 \times 10^{-13}$ cm. This model is used to calculate the total cross section and the angular distribution of the reaction $Li^7(\gamma,t)He^4$ in the range from 2 to 18 Mev. It turns out that the theoretical expression for the cross section is in agreement with the experimental data, provided the potentials in the initial and final states are $V_P = 8.45$ Mev, $V_S = -1$ Mev, and $V_D = 4$ Mev. In addition, to ensure a maximum in the cross section at E = 4.7 Mev it is necessary to assume that there takes place in the excitation of Li^7 a state with energy 4.7 Mev, followed by a decay into H^3 and He^4. No account is taken in the calculation of the Coulomb interaction between the two particles. This account may change strongly the values of V_L.

13535
THE CROSS SECTION FOR THE REACTION $Cs^{135}(n,\gamma)Cs^{136}$. A. P. Baerg, F. Brown, and M. Lounsbury (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Can. J. Phys. 36, 863-70(1958) July.

The effective cross section for the reaction $Cs^{135}(n,\gamma)Cs^{136}$ with reactor neutrons is 10.4 ± 0.5 barns. The measured reaction rate under cadmium yields a value of 61.7 ± 2.3 barns for the resonance integral of Cs^{135}. The thermal cross section is 8.7 ± 0.5 barns as obtained by combining the reaction rates for uncovered and cadmium-covered samples. (auth)

13536
ALPHA DECAY OF SPHEROIDAL NUCLEI. E. M. Pennington and M. A. Preston (McMaster Univ., Hamilton, Ont., Can.). Can. J. Phys. 36, 944-62(1958) July.

A system of coupled differential equations relates the amplitudes of alpha particle waves emitted from a spheroidal nucleus described by the Bohr-Mottelson model. These equations in spheroidal coordinates have been solved for five even-even nuclides with the aid of the electronic computer FERUT. There are four pos-

sible cases for each nuclide which are consistent with the boundary conditions. The solutions of the equations are used to calculate the probability density of alpha particles on the nuclear surface for each case. For Case I the peak in the distribution function shifts from the nuclear symmetry axis to the equator with increasing mass number. The probability density for Case II is always peaked between the symmetry axis and the equator, while for Cases III and IV it is always peaked strongly at the equator. The change in the distribution function with increasing distance from the nucleus is considered for a typical case. Barrier penetration factors are calculated and found to differ from those for spherical nuclei by factors of the order of 2 or 3. Comparison with the calculations of an approximation method of Fröman is made for one nuclide. (auth)

13537

AN INVESTIGATION OF (n,α) AND (n,t) REACTION ON Be^9. S. S. Vasiliev, V. V. Komarov, and A. M. Popova (Research Inst. of Nuclear Physics, Lomonosov, Moscow State Univ.). Doklady Akad. Nauk 119, 914-17(1958) Apr. 11. (In Russian)

Reactions of $Be^9(n,\alpha)He^6$ and $Be(n,t)Li^7$ with fast neutrons at 1 to 19 Mev were studied in prepared nuclear emulsion layers with a filler of fine spectrally pure beryllium dust. A target of lithium irradiated by deuterons, accelerated up to 4 Mev by a 72-cm cyclotron, was used as a neutron source. The stars of (n,t) reactions were of special interest because of the lack of data about this reaction. The effective cross sections of $Be^9(n,\alpha)He^6$ reaction, the angular distribution of α particle in the center of mass system for neutrons at 2 to 5 Mev, and the angular distribution of tritons in the center of mass system from $Be^9(n,t)Li^7$ for neutrons at 13 to 18 Mev are presented graphically. (R.V.J.)

13538

DECAY OF Rh^{106}. E. P. Grigor'ev, A. V. Zolotavin, I. I. Kuz'min, and E. D. Pavlitskaya (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 194-7(1958) Feb. (In Russian)

Radioactive transformation of $Ru^{106} \rightarrow Rh^{106} \rightarrow Pd^{106}$ was studied with a double-focusing β spectrometer. The conversion lines, the total β spectra, and photoelectron spectra were studied. The decay scheme showing the intensity and energy of β and γ transition and spin and parity levels is included. (R.V.J.)

13539

THE Q-VALUE FOR THE $N^{14}(n,\alpha)B^{11}$ REACTION. Tadayoshi Doke, Shoji Suzuki, and Iwao Ogawa (St. Paul's Univ., Tokyo). J. Phys. Soc. Japan 13, 656-7 (1958) June.

A gridded ionization chamber filled with a mixture of 1 atm. nitrogen and 3 to 4 atm. argon was irradiated by D-D neutrons from an accelerator, and the Q-value for the $N^{14}(n,\alpha)B^{11}$ reaction was determined from the pulse-height distribution. (W.D.M.)

13540

THE ANGULAR DISTRIBUTIONS OF THE LONG-RANGE ALPHA-PARTICLES FROM THE REACTION $F^{19}(p,\alpha_0)O^{16}$. Akira Isoya, Haruko Ohmura, and Teruo Momota (Univ. of Tokyo). Nuclear Phys. 7, 116-25 (1958) June (2).

The angular distributions of the long-range alpha particles from the reaction F^{19}+p, leading to the ground state of the residual nucleus O^{16}, have been measured. The energies of protons covered a range from 630 to 1460 kev, and measurements were made in steps of 5 to 10 kev with a proton energy spread of 0.2 per cent. Coefficients in the Legendre polynomial expansion of the angular distribution function were traced in this range. (auth)

13541

ANALYSIS OF THE YIELD CURVES AND THE ANGULAR DISTRIBUTIONS OF THE REACTIONS $F^{19}(p,\alpha_0)O^{16}$ AND $F^{19}(p,\alpha_\pi)O^{16*}$. Akira Isoya (Univ. of Tokyo). Nuclear Phys. 7, 126-45(1958) June (2).

By analysis of the angular distributions of α particles from the reactions $F^{19}(p,\alpha)O^{16}$ leading to the ground state and first excited state of O^{16}(α_0 and α_π respectively), virtual levels of the nucleus Ne^{20} with spin and parity $(even)^+$ and $(odd)^-$ were investigated. Legendre polynomial expansions were adjusted to the data and the coefficients determined over the energy interval from 650 to 1500 kev. These results were then interpreted in terms of the resonance parameters of the compound levels presumed, and the following J values were assigned: J = 2 levels at 731, 778, 843, 1115, and 1356 kev, a J = 1 level at 1250 kev and a J = 0 level at 1160 kev. Background yields are probably due to a few broad levels of J = 0 and 1. For the α_0 channel, vector diagrams of five elements of the collision matrix concerned, which correspond to two values of entrance channel spin and three values of relative orbital angular momentum, were drawn, which reproduce almost all details of observed excitation functions. This procedure gives information about the relative signs of the reduced width amplitudes of the virtual levels. This sign seems to be independent of the entrance channel spin in spite of large fluctuations of the relative yield in both channels from level to level. Yields of α_0, α_π and protons from each resonance are compared and the reduced widths of levels of Ne^{20} are estimated. (auth)

13542

MEASUREMENTS OF (γ, d) AND (γ, np) REACTIONS IN THE THRESHOLD REGION. J. Goldemberg (Universidade de Sao Paulo) and L. Marquez (Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro). Nuclear Phys. 7, 202-8(1958) June (2).

The yield of the combined nuclear reactions (γ, d) and (γ, np) has been measured for Zn^{64}, Zn^{66}, Fe^{54}, and S^{32} by isolating and measuring the activity of the residual nucleus. In the first two cases a curve was found for the cross section with two peaks. In the third case, no residual activity was found and an upper limit is given for the yield. In the fourth case the results found coincide with the results of other workers who had measured this reaction. (auth)

13543

THE POLARIZATION OF PROTONS FROM THE $^{12}C(d,p)^{13}C$ REACTION. M. S. Bokhari, J. A. Cookson, B. Hird, and B. Weesakul (Univ. of Liverpool). Proc. Phys. Soc. (London) 72, 88-96(1958) July.

The polarization of the ground state protons emitted when C^{12} is bombarded with 8.9 Mev deuterons was measured at several angles. These results were compared with recent calculations of Newns and Refai. The angular distribution of the polarization was found to have the predicted shape but its sign and magnitude suggest an improbable proton–nucleus interaction. (auth)

13544

INVESTIGATION OF THE NUCLEAR REACTION $O^{17}(d,n)F^{18}$. V. I. Mamasakhlisov and T. I. Kopaleyshvili (Tbilisi Univ.). Soobshcheniya Akad. Nauk Gruzin. S.S.R. 16, No. 9, 673-80(1955). (Translated

from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 6063.)

The cross section of the reaction $O^{17}(d,n)F^{18}$ is calculated under the assumption that the "breaking up" deuteron enters into the nucleus and the neutron of O^{17} is ejected to the outside. The energy of the deuteron-neutron interaction in O^{17} is chosen in the form $V = g[\delta(\underline{r}_1 - \underline{r}) + \delta(\underline{r}_2 - \underline{r})]$, where r_1 and r_2 are the radius vectors of the neutron and proton entering into the deuteron, $\underline{r}$ the radius vector of the neutron of the nucleus, and $g = (4\pi h^2/M)\, a_0'$ (a_0' is the amplitude of the np scattering). The calculation is carried out in the Born approximation. The potential of the interaction between the particles and the nuclear remnant is chosen in the form of a rectangular well. In the calculations, only three orbital momenta $l = 0$, 1, and 2 are considered. Under the assumption that F^{18} is formed in the ground state, the resultant total effective cross section of the reaction at $E_d = 3.45$ Mev is $\sigma = 0.75$ mb (the experimental value is 0.77 mb). However, the theoretical value of the cross section at $E_d = 3.25$ Mev is barely smaller than this quantity, while the experimental value is 0.60 mb.

13545

INVESTIGATION OF (p,pxn) REACTIONS ON IODINE. M. Ya. Kuznetsova, V. N. Mekhedov, and V. A. Khalkin (Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1096-1100(1958) May. (In Russian)

Formation of the radioactive isotopes I^{126}, I^{125}, I^{124}, I^{123}, I^{121}, and I^{120} from I^{127} was investigated by a radiochemical method, the isotopes being produced by 100, 170, 300, 480, and 660 Mev protons. The experimental data are analyzed and compared with the results of investigation of similar reactions on other elements. The fraction of K capture in I^{126}, I^{124}, I^{121}, and I^{120} was determined. (tr-auth)

13546

ON β TRANSITIONS O-O WITH CHANGE PARITY. B. V. Geshkenbein. Zhur. Eksptl'. i Teoret. Fiz. 34, 1349-50(1958) May. (In Russian)

The shape of the spectra for O-O transitions was observed to be in good agreement with the variation A (the rules of selection prevented the participation of the variant V). Formulas were developed for the polarization of decay electrons and for the angular electron-neutrino correlations. (R.V.J.)

Particle Accelerators

13547 UCRL-3944

California. Univ., Berkeley. Radiation Lab. CORRECTION OF THE MAGNETIC FIELD GRADIENT OF THE BEVATRON WITH POLE-FACE WINDINGS. Harry G. Heard. Sept. 24, 1957. 18p. Contract W-7405-eng-48. $0.75(OTS).

The radial magnetic gradient of the Bevatron, a weak-focusing proton synchrotron, is discussed. The effects of pole-tip configuration, eddy currents, and residual field upon the radial extent of useable magnetic field are discussed. Analytical treatments are given of the perturbing field required to change the radial gradient at any point, the field distribution resulting from an excited pair of windings, and the current distribution required to yield a given field distribution. Three methods of exciting pole-face winding are discussed comparatively. (auth)

13548 UCRL-8261

California. Univ., Berkeley. Radiation Lab. BEVATRON OPERATION AND DEVELOPMENT. XVI. [Period Covered] November, December 1957, January 1958. Walter D. Hartsough and William W. Salsig. May 26, 1958. 23p. Contract W-7405-eng-48. $0.75 (OTS).

The study of interactions and decay of K mesons continued, using the 10-inch liquid hydrogen bubble chamber and emulsions. Four emulsion stacks were exposed for two internal groups and twenty-three stacks were exposed for seventeen groups from outside the Laboratory. Interactions of π^- mesons were observed with a 30-inch propane bubble chamber and with emulsions. Ten emulsion stacks were exposed to neutral-particle beams and one stack to the internal 6.2-Bev proton beam. The 30-inch propane bubble chamber and emulsions were used to study the interactions of antiprotons. Eighteen target bombardments in the internal proton beam were made for the chemistry group. Successful tests were completed of two static-electromagnetic velocity spectrometers for the separation of high-energy particles. One was of coaxial construction, the other of parallel-plate construction. (For preceding period see UCRL-8114.) (auth)

13549

LATEST METHODS OF PARTICLE ACCELERATION. W. Jentschke (Physikalisches Staatsinstitut, Hamburg). Acta Phys. Austriaca 11, 485-510(1958). (In German)

A brief description is given of the circular accelerator and classical focusing methods. New methods of particle acceleration are then discussed, such as alternating-gradient focusing, fixed-frequency alternating-gradient acceleration, and arrangements which make possible the utilization of the total kinetic energy of the bombarding and bombarded particles by the impact of two opposite particle beams. (J.S.R.)

13550

THE RATIONALE OF HIGH-ENERGY LINEAR-ELECTRON ACCELERATOR DESIGN. G. A. Zeitlenok, V. V. Rumyantsev, et al. Atomnaya Energ. 4, 448-54 (1958) May. (In Russian)

The basic parameters for high-energy electron linear accelerators were evaluated. The dependence of the accelerator length, the number of sections, the feeding power, the construction costs, and performance on the magnitude of the electric field potential at the axis wave guide, whose sections are fed by high-frequency generators, was determined. The minimum construction costs and performance do not depend on the final electron energy. It is shown that it is more economical to feed the sections from high-frequency generators of high capacity (~20 Mev). The problem of increasing the high-frequency pulse rate was discussed. (R.V.J.)

13551

A HIGH VOLTAGE ELECTRON INJECTOR GUN FOR SYNCHROTRONS. E. W. V. Acton and K. T. W. Milne (General Electric Co., Ltd., Wembley, Middlesex, Eng.). J. Sci. Instr. 35, 245-7(1958) July.

An improved demountable electron injector gun designed primarily for use in 140 and 30 Mev synchrotrons is described. The maximum energy of injection is 100 kev. Facilities for the exploration of synchrotron injection parameters are provided by micrometer control of both the radius and the injection angle of the beam. Both the cathode assembly and the anode are easily detachable for replacement and experimental purposes. Details of the gun design, its electrical characteristics, and the test apparatus are given. (auth)

13552

PROPOSAL FOR A DISTRIBUTED REGENERATIVE ACTION TO EXTRACT THE BEAM FROM A WEAK-

FOCUSING SYNCHROTRON BY EXCITING THE RESONANCE/2 RADIAL OSCILLATIONS/3 REVOLUTIONS. A. Turrin (Instituto Nazionale di Fisica Nucleare, Frascati, Italy). Nuovo cimento (10) 8, 511-15(1958) May 1.

13553

CONSTRUCTION OF INJECTORS FOR ELECTRON ACCELERATORS. Yu. S. Korobochko and V. I. Mineyev (Leningrad Polytechnic Inst.). Pribory i Tekh. Ekspt. No. 1, 25-8(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8510).

The design and construction of an injector for electron accelerators having reproducibility with good electron-optical properties and a considerable current output is given. (J.S.R.)

13554

EFFECT OF QUANTUM FLUCTUATIONS IN THE ELECTRON RADIATION OF THE SYNCHROTRON OSCILLATIONS. E. M. Moroz (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. JETP 6, 1008-9(1958) May.

The well known results of Sands (Phys. Rev. 97, 470(1956)) on quantum fluctuations in the radiation of electrons in synchrotrons are generalized by taking into account the damping of synchrotron oscillations caused by the increase in electron energy. Several practical results are given. (J.S.R.)

13555

STOCHASTIC THEORY OF ELECTRON VIBRATION INDUCED IN A SYNCHROTRON BY RADIATION. A. N. Matveyev. Trudy 3-go Veesoyuz. Mat. S'ezd. 164(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5756.)

13556

ENERGY AND POWER QUESTIONS IN THE LINEAR ACCELERATOR. Max Wutz. Z. angew. Phys. 10, 268-72(1958) June. (In German)

In the linear accelerator designed by Wideroe, the maintenance of the quasisteady state can be adjusted so that one can obtain only one known maximum energy which is dependent on the frequency because of the vacuum dielectric strength. For the transmission power necessary for the production of this energy an expression is given which shows that the power efficiency is best in the short waves. An arrangement consisting of more steps appears to produce favorable results which are discussed on the basis of a numerical example. (tr-auth)

13557

ON CAPTURE OF ELECTRONS IN A BETATRON. A. N. Matveev (Moscow State Univ.). Zhur. Ekspti'. i Teoret. Fiz. 34, 1331-3(1958) May. (In Russian)

It is shown that the statistical mechanism of electron capture in a betatron can act only with injected electrons of small densities and that it is conditioned by Coulomb interaction. Mathematical expression for the capture theory is developed. (R.V.J.)

Radiation Absorption and Scattering

Refer also to abstract 13289.

13558 AFOSR-TR-58-63

South Carolina, Univ., Columbia.

STUDIES OF POSITRON LIFETIMES IN SOLIDS. Final Report. A. P. French and A. R. Lowrey. Apr. 1958. 61p. Contract AF49(638)-74. (AD-158241).

The effect of an internal electric field on the mean lifetime of positrons in a ferroelectric material was studied. The internal electric field can effectively be "turned on or off" by raising or lowering the samples' temperature above or below the Curie temperature. A fast coincidence circuit (resolving time approximately 3 mμ sec) was assembled. The components not commercially available were constructed and the equipment was calibrated. Decay curves were run for several materials, some of which were previously studied, (aluminum, teflon, polyethylene, and plexiglas). The results compare favorably with measurements obtained by others. The decay curve was run for Rochelle Salt, a ferroelectric crystal with an internal field of approximately 800 esu between the temperatures 255 and 297°K. Several measurements were taken with the sample above the critical temperature of 297°K, and the lifetime was found to consist of one component, $\tau_1 = (5.25 \pm 0.25) \cdot 10^{-10}$ sec. (auth)

13559 HW-48814

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

EFFECTIVE SCATTERING MASSES FOR MIXTURES. H. Neumann. Feb. 27, 1957. 5p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The Hanford finite mass spherical harmonics code is not directly suited to computation of fluxes in regions involving mixtures of nuclear species. In the present code only a single absorption cross section, scattering cross section, and scattering mass may be assigned to each region. A formula for effective mass for mixtures is given and applied to H_2O and D_2O. (auth)

13560

SOLID ANGLE CORRECTIONS TO SINGLE SCATTERING. F. F. Heymann and P. I. P. Kalmus (University Coll., London). Brit. J. Appl. Phys. 9, 271-9(1958) July.

Corrections relating the average intensity of particles scattered into an aperture of finite solid angle to the intensity at the center of the aperture are given for rectangular and circular apertures. The dependence of the corrections on aperture shape and scattering angle is calculated for electrons scattered according to the simple Mott formula. (auth)

13561

EFFECTIVE CROSS SECTION OF A MOLECULE OF METHYL MERCAPTAN FOR THE SCATTERING OF SLOW NEUTRONS. V. Koloye (Physics Inst., Polish Academy of Sciences). Byull. Polon. Akad. Nauk 3,4, No. 5, 263-5(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8856.)

The cross section for the scattering of slow neutrons by a molecule of methyl mercaptane is derived. The effect of the vibrations of the molecule are taken into account under the assumption that it is the same as for methane. Ideas concerning the role of association are stated.

13562

APPROXIMATE EQUATIONS FOR THE AMPLITUDE OF PHOTON SCATTERING ON NUCLEONS. A. N. Tavkhelidze and V. K. Fedyanin (Joint Inst. of Nuclear Studies). Doklady Akad. Nauk S.S.S.R. 119, 690-3(1958) Apr. 1. (In Russian)

Approximation equations for physical amplitudes were developed on the basis of Compton scattering dispersion relations. (R.V.J.)

13563

CONCERNING THE ENERGY LOSSES OF FAST CHARGE PARTICLES IN AN ABSORBING MEDIUM.

V. A. Shakhbezyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Izvest. Akad. Nauk Armyan. S.S.R. Fiz. Mat. Estestven. i Tekh. Nauki 9, No. 5, 91-8(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8842.)

The total energy losses are subdivided into the loss for excitation and ionization and that for Cherenkov radiation for an absorbing medium in the general case of arbitrary values of the attenuation constants. The problem of the definition of the concept of Cherenkov radiation in the case of an absorbing medium is discussed. A detailed analysis is made of the ratio of the values of the Bohr and Cherenkov losses of energy near the trajectory of the particles and at infinity for various values of the attenuation constant.

13564

A TABLE OF INCOHERENT SCATTERING COEFFICIENTS. T. Tietz (Univ. of Lodz, Poland). Nuovo cimento (10) 8, 441-4(1958) May 1. (In German)

The incoherent scattering coefficient is converted to a form which gives the possibility for a simple practical calculation. With the help of the more numerically accurate Thomas-Fermi values obtained by Kobayashi the incoherent scattering coefficient is tabulated. An approximation of the coefficient is also derived. (tr-auth)

13565

GAMMA-GAMMA ANGULAR CORRELATIONS WITH CIRCULAR POLARIZATION MEASUREMENTS. E. G. Beltrametti (Univ. of Genoa). Nuovo cimento (10) 8, 445-50(1958) May 1.

The problem of the γ-γ double angular correlation is examined in which the circular polarization state of photons is observed. The relation among the various possible correlations is discussed. The Legendre polynomials of odd order introduce an asymmetry around the value $\beta = \pi/2$, where β is the angle between the two radiations. Numerical calculations have been made for the γ-γ cascade of Co^{60}. (auth)

13566

ANGULAR CORRELATION OF ANNIHILATION RADIATION IN WATER, ICE AND MERCURY. P. Colombino, S. De Benedetti, I. Degregori, and L. Trossi (Univ. of Turin). Nuovo cimento (10) 8, 508-10(1958) May 1.

The annihilation source and the counter slits are horizontal, in order to make possible the study of the annihilation from the liquid surfaces. The liquids are contained in a small open cell and are bombarded with positrons from a source situated a few millimeters above their surface. In order to study the effect of change of state, the angular correlation in water and ice was investigated. The experimental results are shown graphically. The central points have an angular resolution of 0.5×10^{-3} rod. Contrary to expectations the curve referring to ice shows a sharp peak while the liquid curve is more rounded. Water does not show any significant difference between liquid and solid state. (A.C.)

13567

A REMARK ON THE TIME-DEPENDENT PAIR DISTRIBUTION. Leon Van Hove (Instituut voor theoretische fysica der Rijksuniversiteit, Utrecht, Netherlands). Physica 24, 404-8(1958).

After recalling the classical work of Zernike and Prins on the pair distribution function of a liquid or gas and its role in x-ray scattering theory, there is a brief discussion of the time-dependent generalization of this distribution function, which is of special interest for neutron scattering. In line with an earlier result of Fano, it shows that the imaginary part of the time-dependent pair distribution directly describes the local density change produced in a liquid or gas by the presence of a neutron. (auth)

13568

ELASTIC SCATTERING OF SLOW POSITRONS BY HYDROGEN ATOMS. B. L. Moiseiwitsch (Queen's Univ. of Belfast). Proc. Phys. Soc. (London) 72, 139-41(1958) July.

The elastic scattering cross sections of slow positrons by hydrogen atoms were calculated and compared with the calculations of Massey and Moussa (1958). Cross sections were computed considering polarization and neglecting polarization. Good agreement was found with the values of Massey and Moussa. (W.D.M.)

13569

SCATTERING OF γ-RAYS BY NUCLEONS WITH ALLOWANCE FOR THE INFLUENCE OF THE CHARGED MESON FIELD AROUND THE NUCLEONS AND OF THE SPIN STATE OF THE NUCLEONS AND PHOTONS. A. I. Mukhtarov. Uchenye Zapiski Azerbaidzhan Univ. No. 8, 13-25(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8627.)

By use of the weak-coupling theory, the scattering of a photon, with an energy close to 150 Mev, by a nonrelativistic nucleon surrounded by a meson field is considered. The curves obtained for the dependence of the effective scattering cross section on the energy display resonant maxima.

13570

STUDIES OF INTERACTIONS OF HIGH ENERGY PROTONS WITH COMPLEX NUCLEI. Helge Tyren. Ph.D. Thesis, Univ. of Uppsala, 1958.

Polarization measurements in elastic and inelastic scattering processes initiated by bombardment of light nuclei by 185-Mev protons made over a period of 2 years are discussed. (T.R.H.)

13571

ELASTIC SCATTERING OF 5.4 Mev PROTONS BY VARIOUS NUCLEI. A. P. Klyucharev, L. I. Bolotin, and V. A. Lutsik (Physico-Tech. Inst., Academy of Sciences, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 30, 573-4(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8811.)

A study was made of the angular distribution of protons with initial energy 5.4 Mev, elastically scattered by nuclei of beryllium, carbon, fluorine, magnesium, aluminum, calcium, manganese, nickel, copper, and zinc. The protons scattered by angles from 20 to 160° were simultaneously recorded by photographic plates. The angular resolution was ±2.5°. The targets employed were thin (several microns) films or foils. The angular distribution obtained for the scattered protons differs sharply from the Coulomb distribution, and is not the same for the various nuclei. For beryllium and carbon a large maximum of scattering was observed near 150 to 160°, but the ratio of the cross section of the nuclear scattering to the Coulomb scattering in carbon is four times greater than in beryllium. This was attributed to the formation of a intermediate N^{13} nucleus, which has an excitation level in this region, and consequently resonant scattering takes place. The scattering of manganese and aluminum is similar. The distributions for nickel, copper, and zinc are identical. For manganese the qualitative course of the distribution is analogous to that of the proceeding elements, but the minimum and the second maximum are shifted towards the larger angles. An unexpectedly large value was obtained for the ratio for calcium, particularly at large angles. For heavier nuclei there was a pronounced manifestation of the in-

terference nature of elastic scattering. Attempts to treat the results in accordance with an optical model were not successful.

13572

ELASTIC SCATTERING OF NEUTRONS BY 580 Mev PROTONS. Yu. M. Kazarinov and Yu. N. Simonov Inst. of Nuclear Problems, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 31, 169-73(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8666.)

Differential cross sections were measured for elastic scattering of neutrons by 580 Mev protons in the angular region θ = 35 to 180° (in the center of mass system) with a 2° angular resolution. The character of the $\sigma_{np}(\theta)$ dependency indicates that at 600 Mev there arises in the neutron-proton system a noticeable interaction in states with orbital moments up to l = 6. The results do not contradict the hypothesis of charge independence.

13573

AN INVESTIGATION OF THE ELASTIC SCATTERING OF 590 Mev NEUTRONS BY NEUTRONS. B. M. Galovin and V. P. Dzhelepov (Inst. of Nuclear Problems, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 31, 194-201(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8665.)

The differential scattering across section for the elastic scattering of neutrons by neutrons was determined using a neutron telescope. The effective energy of the neutrons was 590 Mev. A striking anitropy of the (n-n) scattering has been established: $\sigma_{nn}(30°)/\sigma_{nn}(90°)$ = 2.3. It was found that the differential (n-n)-scattering cross section in the angular region ($30° \leq \theta \leq 90°$) is equal to the proton-proton cross section at the same energy within experimental error. This fact, together with the results earlier work on neutron-neutron scattering at 300 Mev points directly to the charge symmetry of nuclear forces at high energies.

13574

CONCERNING THE PROBLEM OF SCATTERING LENGTHS OF SLOW NEUTRONS ON DEUTERONS. A. S. Davydov and G. F. Filippov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 31, 340-1(1956). (Translated from Referat. Zhur. Fiz. No. 4, 1957, Abstract No. 8788.)

The scattering of slow neutrons by deuterons is fully determined by two scattering lengths $a_{3/2}$ and $a_{1/2}$ corresponding respectively to two possible spin states of the system. According to the experimental data two variants of the values of the scattering length are possible. A qualitative estimate, based on the Pauli principle, favors the variant $a_{3/2} = 6.2 \times 10^{-3}$ cm, and $a_{1/2} = 0.8 \times 10^{-3}$ cm.

13575

POLARIZATION IN HIGH ENERGY ELASTIC SCATTERING. L. I. Lapidus (Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1148-53 (1958) May. (In Russian)

Polarization phenomena in elastic scattering at high energies are considered. It is shown that nucleon beams with a high degree of polarization can be obtained in small angle scattering. Applicability of the black nucleus and gray nucleus approximations to high energy p–p scattering is discussed. (tr-auth)

13576

ANGULAR DISTRIBUTION OF INELASTICALLY SCATTERED DEUTERONS. V. I. Mamasakhisov and T. I. Kopaleishvili (Inst. of Physics, Academy of Sciences, Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1169-75(1958) May. (In Russian)

Inelastic scattering of deuterons on Mg^{24} and C^{12} nuclei is considered on the basis of the generalized nuclear model. The Mg^{24} nucleus is considered to be deformed and the C^{12} nucleus to be spherical. The angular distributions of scattered deuterons are computed with account of coulomb interaction by assuming that a rotational level is excited in the Mg^{24} nucleus as a result of collision with a deuteron whereas a single photon is excited in the C^{12} nucleus. The results obtained are compared with the experimental data. (tr-auth)

13577

ON THE INELASTIC SCATTERING OF DEUTERONS. Mohamed El Nadi (Cairo Univ., Egypt). Zhur. Eksptl' i Teoret. Fiz. 34, 1207-10(1958) May. (In Russian)

The inelastic scattering of deuterons is assumed to occur in some cases by direct interaction. The incident deuteron is merely scattered and forms the outgoing particle. An expression is derived for the angular distribution of the scattered deuterons and found to agree with the experimental observations for 14.4 Mev deuterons scattered from the 4.61 Mev level of Li^7 (tr-auth)

13578

USE OF THE OPTICAL MODEL FOR ANALYSIS OF π-p AND p-p-SCATTERING AT HIGH ENERGIES. V. G. Grishin, I. S. Saitov, and I. V. Chuvilo (Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1221-9(1958) May. (In Russian)

π–p- and p–p-scattering at energies above 1 Bev in the laboratory system is analyzed on basis of a model of the nucleon according to which the latter is considered as an optically homogeneous sphere with sharp boundaries and a complex refraction index. It is demonstrated that the available experimental data can be described by choosing a sphere of radius $R = (1.08 \pm 0.07) \times 10^{-13}$ cm which is independent of the type of the interacting particles or of their energy. The optical characteristics of the sphere are computed. The contribution of the imaginary and real parts of the scattering amplitude to the elastic scattering cross section are estimated. For π-meson energies of 1.37 Bev and proton energies above 5 Bev the contribution from the real part of the scattering amplitude is small and thus at higher energies analysis of scattering can be carried out on basis of the general scattering theory without taking into account the spin characteristics of the interaction, or else on basis of the model of a purely absorbing sphere. The possible behavior of the cross sections for π–p- and p–p interaction with increase of the energy of the colliding particles is discussed. (tr-auth)

13579

EXCITATION OF VIBRATIONAL AND ROTATIONAL STATES OF NUCLEI DUE TO SCATTERING OF NUCLEONS. S. I. Drozdov. Zhur. Eksptl'. i Teoret. Fiz. 34, 1288-91(1958) May. (In Russian)

Scattering of fast nucleons by black nuclei possessing rotational or vibrational levels is considered in the adiabatic approximation. It is shown that in the diffraction region of scattering angles the shape of the angular distributions of nucleons of definite energy, which are scattered with an excitation of a given collective level of an even-even nucleus, does not depend on whether the level is a rotational or vibrational one. (tr-auth)

13580

ANALYSIS OF NON-RELATIVISTIC AMPLITUDE OF SCATTERING AND POTENTIAL. Ya. A. Smorodinskii

(Joint Inst. of Nuclear Studies). Zhur. Eksptl'. i Teoret. Fiz. 34, 1333-5(1958) May. (In Russian)

A method related to the reverse problem in the theory of scattering (I. M. Gel'fand et al., Izvest Akad. Nauk S.S.S.R. Ser. Math. 15, 309, 1957) was used to confirm that the amplitude of particle scattering in central field forces at a given moment of motion cannot be analytically extented into the upper semi-plane of the variable k. (R.V.J.)

13581

COMPTON SCATTERING OF LONGITUDINALLY POLARIZED PHOTONS ON ELECTRONS WITH ORIENTED SPIN. A. A. Sokolov and B. A. Lysov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1351-4(1958) May. (In Russian)

The quantum electrodynamics of electro–proton scattering with longitudinal polarization is studied in relation to the non-conservation of parity. (R.V.J.)

Radiation Effects

13582 WAPD-P-656

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

IRRADIATION OF PLASTIC FUEL TAPES. PART II. R. T. Jones and E. R. Sanford. Apr. 1955. Decl. Feb. 10, 1958. 62p. $9.30(ph OTS); $3.60(mf OTS).

The investigation of the behavior of polyethylene fuel tapes subjected to high neutron fluxes has been extended. More detailed data on the expansion characteristics of the subject fuel tape indicate that the onset of expansion occurs at an integrated thermal neutron flux of 1×10^{13} neutrons/cm^2 and that the specimen volumes have doubled at 2.5×10^{13} neutrons/cm^2. "Aging" data show that expansion during a high flux exposure will be entirely prevented by a preliminary exposure of 2×10^{14} neutrons/cm^2 at a low flux, and that expansion will be approximately halved by a preliminary exposure of 2×10^{13} neutrons/cm^2. Electron bombardment from a Van de Graaff accelerator has been successfully used to simulate "aging" produced by the preliminary low flux neutron exposures. No quantitative data have been obtained regarding the limiting of expansion by pressure. Temperature tests show that extensive softening and decomposition of the plastic occurs at 270°C and above. Particle size observations indicate that the most probable diameter of a U_3O_8 particle in the subject tapes is between zero and five microns. (auth)

13583

PARAMAGNETIC RESONANCE ABSORPTION OF A V CENTER IN LiF. Truman O. Woodruff and Werner Kanzig (General Electric Research Lab., Schenectady, N. Y.). Phys. and Chem. Solids 5, 268-87(1958).

By x-irradiation of LiF at liquid-nitrogen temperature, an electron-deficiency center is created that can be described as a F_2–molecule-ion, as was shown in previous work by Castner and Känzig. A more rigorous and complete study of the paramagnetic resonance absorption spectrum of this center is presented. The spin energy matrix based on the spin Hamiltonian proposed in the previous paper has been diagonalized, and it is shown that the allowed and forbidden transitions between the resulting energy levels are in good agreement with the observed paramagnetic resonance lines, for any orientation of the crystal in the d-c magnetic field. (auth)

Radioactivity

13584

BREMSSTRAHLUNG OBSERVED IN CONJUNCTION WITH NUCLEAR FISSION. A. I. Alekseev. Atomnaya Energ. 4, 465-6(1958) May. (In Russian)

Analysis was made of nuclear fission into two fragments with the mass number A_1 and A_2 and with Z_1 and Z_2 charge. (R.V.J.)

13585

A METHOD OF PREPARING STABLE ALPHA-, BETA-, AND GAMMA-SOURCES USING INORGANIC ENAMELS. D. M. Ziv, G. S. Sinitsyna, I. A. Efros, and E. A. Volkova. Atomnaya Energ. 4, 469-70(1958) May. (In Russian)

A method is offered for preparing α, β, and γ sources with an enamel base binding and shielding material. Stable α, β, and γ sources were prepared from radium salts with gold backing. The enamel composition was 30% BaO, 3% B_2O_3, 30% PbO, 34% SiO_2, 3% Na_2O. (R.V.J.)

13586

GAMMA RAYS FROM THE PROTON BOMBARDMENT OF SILICON. Eiji Okada, Iwao Miura, Tetsuo Wakatsuki, and Yasuo Hirao (Osaka Univ.). J. Phys. Soc. Japan 13, 541-4(1958) June.

The gamma-ray spectrum from silicon bombarded by 5.7-Mev protons has been studied with a scintillation spectrometer. The following gamma rays due to inelastic scattering of protons were observed: 1.78 Mev (Si^{28} 1st—ground), 1.28 Mev (Si^{29} 1st—ground), 2.03 Mev (Si^{29} 2nd—ground), 2.43 Mev (Si^{29} 3rd—ground), 2.24 Mev (Si^{30} 1st—ground). Excitation curves for the 1.78-Mev gamma rays have been measured in the proton energy range from 2.2 to 5.7 Mev. Resonances were found at 2.9, 3.5, 4.4, 5.0, and 5.4 Mev. At 5.4 Mev, the angular distribution of the 1.78 Mev gamma rays was measured. By comparison with theory, the corresponding compound level of P^{29} at 7.9 Mev was assigned $d_{5/2}$. The cross section for this process is 250 mb. (auth)

13587

AVERAGE ENERGY OF SULFUR-35 BETA DECAY. Howard H. Seliger, Wilfrid B. Mann, and Lucy M. Cavallo. J. Research Natl. Bur. Standards 60, 447-50(1958) May.

The rate of energy emission in an approximately 400-millicurie source of sulfur-35 was measured by means of a "radiation-balance" microcalorimeter. This value and the disintegration rate of an accurate dilution of the sample measured by means of $4\pi\beta$-gas-proportional counting yield a mean energy for sulfur-35 beta decay of 50.4 ($^{+0.1}_{-1.2}$) kev. The half life has been determined to be 87.16 ± 0.1 days. (auth)

13588

REVISION OF $^{212}_{83}$Bi γ-SPECTRUM BY MEANS OF THE γ-α COINCIDENCES. B. Chinaglia and F. Demichelis (Istituto di Fisica Sperimentale del Politecnico, Turin). Nuovo cimento (10) 8, 365-8(1958) May 1.

The fast-slow coincidences between the Bi^{212} γ rays and the Po^{212} α particles allow separating these γ rays from those emitted by the other nuclides in equilibrium in the Th^{228} source. From the results some γ rays uncertain in previous experimental researches are assigned. A decay scheme is proposed. (auth)

13589

NUCLEAR SPECTROSCOPIC INVESTIGATIONS OF THE NUCLIDES $^{228}_{90}$Th, $^{224}_{88}$Ra, $^{212}_{82}$Pb, $^{212}_{83}$Bi, $^{208}_{81}$Tl. F. Demi-

chelis, B. Chinaglia, and G. Trivero (Istituto di Fisica Sperimentale del Politecnico, Turin). Nuovo cimento (10) 8, 369-77(1958) May 1.

The γ spectrum of Th^{228} in equilibrium with its decay products has been investigated by means of two scintillation spectrometers and a fast slow coincidence set up in the range 0.05 to 0.76 Mev. From the results the decay schemes of the nuclides Pb^{212} and Th^{228} are confirmed. For the nuclides Ra^{224} and Bi^{212} the existence of two γ rays which fit the energy levels already proposed by other authors as ascertained, through a direct measurement. Moreover some till now unknown γ rays are found which must be assigned to the $Tl^{208} \rightarrow Pb^{208}$ decay. According to these data a new decay scheme for Tl^{208} is proposed. (auth)

13590

DECAY OF HYPER-^{5}He. R. D. Hill (Univ. of Illinois, Urbana). Nuovo cimento (10) 8, 459-62(1958) May 1.

Energy and angular distributions of the particles arising from a number of cases of the decay of He^5 have been analyzed. The influence of the strong spin-orbit coupled He^4-H^1 state on the decay of He^5_Λ is noted. (auth)

13591

SHAPE AND POLARIZATION OF THE BETA SPECTRUM OF RADIUM E. A. Bincer, E. Church, and J. Weneser (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 95-7(1958) Aug. 1.

The conditions the experimentally observed spectral shape imposes on the degree of polarization of the beta particles from RaE (Bi^{210}) were investigated. The simplest formulation of the problem consistent with present experimental facts was assumed. (W.D.M.)

13592

POLARIZATION OF CONVERSION ELECTRONS FOLLOWING β DECAY. M. E. Rose and R. L. Becker (Oak Ridge National Lab., Tenn.). Phys. Rev. Letters 1, 116-18(1958) Aug. 1.

The beta particle polarization analysis entails conversion of longitudinal to transverse polarization and the consequent loss of intensity. An alternative procedure which may offer some advantages, particularly for beta transitions followed by moderately low-energy conversion electrons, is discussed. This involves the measurement of the polarization of the conversion electrons in coincidence with the beta. (W.D.M.)

13593

A RE-MEASUREMENT OF TWO GAMMA RAY LINES FROM ^{152}Eu AND ^{154}Eu. B. Andersson. Proc. Phys. Soc. (London) 72, 148(1958) July.

A new measurement of the 0.122- and 0.123-Mev gamma-ray lines was made with a curved-crystal gamma spectrometer. The line profiles were studied on both sides of the zero point of the spectrometer. (W.D.M.)

13594

URANIUM AND RADIUM IN THE GROUND WATER OF THE LLANO ESTACADO, TEXAS AND NEW MEXICO. F. B. Barker and R. C. Scott (U. S. Geological Survey, Denver). Trans. Am. Geophys. Union 39, 459-66(1958) June.

Water samples were collected from 47 wells and springs in the Ogallala formation in the Llano Estacado section of the High Plains, Texas, and New Mexico. The Ogallala, a fluviatile geologic terrane, is hydrologically and geologically isolated in this region, therefore, the observed radiochemical concentrations are considered as inherent characteristics of the formation in this area. The uranium concentrations ranged from 0.9 to 12 parts per billion (ppb) (median 6.2 ppb), and the radium concentrations ranged from <0.1 to 0.8 mμc per liter (median 0.1 $\mu\mu$c/l). The uranium concentrations show a tendency to correlate with the gross chemical character of the waters in accordance with the expected chemical behavior of uranium. The departure of the radium-uranium ratios in all samples from radioactive equilibrium value is explained on the basis of carbonate-complexing of uranium and selective adsorption of radium by minerals having a capacity for base exchange. (auth)

13595

ON THE RESULTS PRODUCED BY A TWO-COMPONENT ELECTRON IN β INTERACTIONS. B. L. Ioffe and V. A. Lyubimov. Zhur. Eksptl'. i Teoret. Fiz. 34, 1321-3(1958) May. (In Russian)

Expressions for various effects are simplified. Six independent constants and matrix for the case of permissible transitions are analyzed. (R.V.J.)

Rare Earths and Rare-earth Compounds

13596

THE ELECTRICAL CONDUCTIVITY OF LEAD(II) OXIDE WITH THE ADDITION OF NEODYMIUM OXIDE. Horst Grunewald and Werner Neumann (Pädagogische Hochschule, Institut für Experimentalphysik, Potsdam, Germany). Ann. Physik 1, 198-200(1958). (In German)

An investigation was made of the dependence of the electric conductivity of PbO on the neodymium oxide content in the temperature range 200 to 500°C. The neodymium oxide content varied between 0 and 2.0 mole %. It was found that at a temperature of 200°C, the conductivity of the lead oxide as a function of the Nd_2O_3 content shows a very faint increasing tendency while at 300, 400, and 500°C the conductivity of PbO decreases with increasing Nd_2O_3 content. (tr-auth)

13597

SPIN EXCHANGE IN SUPERCONDUCTORS. B. T. Matthias, H. Suhl, and E. Corenzwit (Bell Telephone Labs., Murray Hill, N. J.). Phys. Rev. Letters 1, 92-4 (1958) Aug. 1.

Small amounts of the magnetic rare earths were dissolved in lanthanum, and the effects on the superconducting transitions are shown. The change in the superconducting transition temperature of lanthanum caused by varying the dissolved amounts of gadolinium was investigated in detail, and the results are shown graphically. (W.D.M.)

Shielding

13598 NDA-10-144

Nuclear Development Associates, Inc., White Plains, N. Y.

PLANE ISOTROPIC GAMMA-RAY BUILDUP FACTORS IN LEAD AND WATER WITH APPLICATIONS TO SHIELDING CALCULATIONS. Stanley Preiser, Phillip S. Mittelman, and Charles R. Berndtson. Dec. 21, 1954. 17p. For Pratt and Whitney Aircraft Div.

Plane isotropic dose (B_r) and energy absorption (B_a) buildup factors were calculated for gamma rays in lead and water for various initial energies from 0.5 to 10 Mev and for penetrations up to 15 mean free paths. These buildup factors, computed by numerical integra-

tion of point isotropic buildup factors, are compared with plane isotropic buildup factors computed using two approximate methods. Specific examples of the use of plane isotropic buildup factors in simple shielding geometries are given. (auth)

13599
THE ECONOMICS OF HEAVY CONCRETE AS A RADIATION SHIELD. A. N. Komarovskii. Atomnaya Energ. 4, 437-42(1958) May. (In Russian)

A review is given of foreign publications on the use of various types of concrete for biological protection against radiation from nuclear reactors and heavy particle accelerators. The economics of heavy concrete shields or ordinary concrete with mineral admixtures are discussed. Calculations and economic analysis made by Russian specialists are included. The results show that special heavy concrete shielding should be used only in exceptional cases. (tr-auth)

13600
RADIATION PROTECTION. A. Ye. Desov. Stroitel. Prom. No. 2, 28-31(1956). (Translated from Referat. Zhur. Khim. No. 3, 1957, Abstract No. 10713).

The absorption coefficient for Co^{60} γ radiation was measured for five concrete compositions using heavy fillers and for cast iron. Slabs 75 by 75 by 10 cm and 75 by 75 by 3 cm were irradiated with γ-rays, using a broad and a narrow beam. It was established that when a narrow beam (diameter of the diaphragm, 10 to 12 mm) is used the intensity of the radiation decreases more rapidly than when a broad beam is used. The absorption coefficient (in cm^{-1}) for narrow and broad beams are as follows: cast iron, 0.42 and 0.289; concrete with various fillers: limonite and cast iron, 0.249 and 0.205; sand and cast iron, 0.22 and 0.186; limonite and limonite, 0.152 and 0.136; sand and gravel, 0.134 and 0.123; sand and gravel with the addition of borax, 0.135 and 0.122. Also included are a nomogram for finding the shielding thickness as a function of the desired degree of absorption of the rays, data on the composition of the concretes investigated, diagrams of the apparatus, and attenuation curves for Co^{60} radiation.

13601
CONCRETE FOR RADIATION SHIELDING APPLICATIONS. S. A. Mironov and J. K. Ponomarev. Beton i zhelezobeton No. 7, 259-62(1956). (Translated from Referat Zhur. Khim. No. 3, Abstract No. 10715).

The authors discuss briefly the composition and properties of various types of concrete used in radiation shielding applications. Empirical formulas are given for the calculation of the half-thickness for gamma radiation in various concretes as a function of the energy of radiation.

Spectroscopy

Refer also to abstract 13256.

13602
A NOTE ON THE CALCULATION OF SECOND MOMENTS OF NUCLEAR MAGNETIC RESONANCE ABSORPTION LINES. J. G. Powles (Univ. of London). Brit. J. Appl. Phys. 9, 299-300(1958) July.

A convenient graphical method for calculating the second moments of broad nuclear magnetic resonance absorption lines is presented. (W.D.M.)

13603
DOUBLE MAGNETIC-LENS SPECTROMETER WITH IMPROVED FOCUSING FOR RECORDING COINCIDENCES. V. A. Sergienko (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 198-207(1958) Feb. (In Russian)

The design and performance of a spectrometer for studying β-e and e-e coincidences with satisfactory number ratio of true and accidental coincidences are described. (R.V.J.)

13604
ABSORPTION SPECTRA OF NEODYMIUM CARBOXYLATE COMPLEXES. R. C. Vickery (Horizons Inc., Cleveland). J. Mol. Spectroscopy 2, 308-31(1958) June.

Variations in absorption spectrum of the Nd^{3+} ion on complex formation with aliphatic carboxylate ions have been examined spectrophotometrically and an attempt made to correlate band shift with thermodynamic complexity constants. With mono- and α-carboxylic acids as the complexing ligands, shift of the Nd 576 mμ band to lower frequencies is approximated by changes in the free energy of the complexes formed. With dibasic and higher carboxylic acids the reverse is observed, band shifts towards lower energy levels being associated with increasing values of ΔA. No definitive explanation is presented for this anomaly; but dsp-hybridization, with possible involvement of 4-f electrons, is considered a feasible reason. (auth)

13605
FINE STRUCTURES OF X-RAY K ABSORPTION SPECTRA OF NICKEL IN OXIDES OF NICKEL. Kenjirō Tsutsumi (Osaka Univ.). J. Phys. Soc. Japan 13, 586-90(1958) June.

The fine structures of x-ray K absorption spectra of nickel in metallic nickel, NiO, Ni_2O_3, and $NiO_2 \cdot nH_2O$ were photographed by a bent crystal spectrograph. The fine structures of absorption spectra of metallic nickel and NiO agree well with those published by previous authors, but those of Ni_2O_3 do not coincide with those reported by Hayasi and Cauchois. This seems to be due to doubtful chemical structures of Ni_2O_3. The first absorption maxima are much more pronounced with increasing oxygen proportion, and the general features of α, β, C, and γ of the absorption spectra of oxides are similar, respectively. However, the second small absorption maxima are less pronounced with increasing oxygen proportion. It may be considered from the comparison of the present curves of absorption spectra only that nickel sesquioxide is a mixture of NiO and $NiO_2 \cdot nH_2O$. (auth)

13606
SCINTILLATION GAMMA SPECTROMETER WITH CsI(Tl) CRYSTAL. L. L. Pelekis (Inst. of Physics, Academy of Sciences, Latvian SSR). Latvijas PSR Zinatnu Akad. Vestis No. 4, 105-12(1956). (Translated from Referat. Zhur. Fiz. No. 3, 1957, Abstract No. 5783.)

A description is given of the circuit and of the operating characteristics of a gamma spectrometer with a FEU-19 photomultiplier and a CsI(Tl) crystal 34 mm in diameter and 16 mm thick. The experiments show that the CsI crystal has an effective fraction of photo absorption that is 70% greater (for $E \approx 1$ Mev) than that of an NaI crystal of the same dimensions. The relatively low resolution of the spectrometer (15% for E = 0.66 Mev) is due principally to the quality of the FEU-19 photomultipliers.

Theoretical Physics

13607 AFOSR-TN-58-630
Maryland. Univ., College Park.
DISPERSION RELATIONS AND SCHWARTZ'S DISTRI-

BUTIONS. Physics Department Technical Report No. 109. John G. Taylor. [1958]. 13p. Contract AF49 (638)-24. (AD-162160).

The relation between strict causality and the dispersion relations for systems in which the output is a linear time-independent function of the input is considered. The equivalence of strict causality and the condition that the Fourier transform $A(\omega)$ satisfies a general dispersion relation are shown. (W.D.M.)

13608

THE JANOSSI WAVE EQUATIONS AS A NUCLEAR THEORY OR AS A THEORY OF ELEMENTARY PARTICLES. Chzhu Khunyuan' (Inst. of Physics, Acad., Sinica, China). Acta Phys. Sinica 12, No. 1, 29-40 (1956). (Translated from Referat Zhur. Fiz. No. 3, 1957, Abstract No. 5912.)

It is shown that the modified Schroedinger equation, proposed by Janossi (Acta Phys. Acad. Sci. Hung. 1, 423(1952)) cannot describe correctly the property of the electron. However, this equation can be considered as a model of a possible phenomenological theory of elementary particles. The possibility of quantizing this equation is considered.

13609

THE APPLICATION OF THE VARIATION PRINCIPLE TO THE SUPERCONDUCTION THEORY. I. A. Kvasnikov. Doklady Akad. Nauk S.S.S.R. 119, 675-7 (1958) Apr. 1. (In Russian)

A hamiltonian is developed for superconductivity of superconducting materials. (R.V.J.)

13610

ANALYTIC FORMS OF THE DEUTERON WAVE FUNCTION. Michael J. Moravcsik (Brookhaven National Lab., Upton, N. Y.). Nuclear Phys. 7, 113-15(1958) June (2).

Recently Gartenhaus (Phys. Rev. 100, 900(1956)) calculated a deuteron wave function from the cut-off meson theory. Since the theoretical background of his calculations is perhaps more reliable than the basis of the generally used Hutthin wave function, one would like to make use of this new wave function in various calculations. For this purpose, it is desirable to approximate the Gartenhaus wave function, which is given in a numerical form, by an analytic expression which is simple enough to be useful in the various integrals which arise when one calculates phenomena involving the deuteron. Three such approximations of varying degrees of accuracy are proposed. (A.C.)

13611

THE CAUSAL FUNCTION AND THE CAUSALITY CONDITION. S. T. Ma (Univ. of Sydney). Nuclear Phys. 7, 163-8(1958) June (2).

This article is concerned with the connection between the Stueckelberg-Feynman causal function and the causality condition, i.e. the condition that no disturbance in a wave field can travel faster than light. It contains an analysis of the S-matrix for the scattering of electrons by electrons, and the scattering of nucleons by nucleons, which both involve the causal propagation function for the exchanged bosons. By means of certain mathematical relations for the causal function, the S-matrix is partitioned in such a way that each term by itself fulfils the causality condition for all distances, large or small. The mathematical treatment is applicable to the scattering of any number of fermions with the exchange of any number of bosons. A physical interpretation, according to which the partitioned S-matrix describes the various modes of the propagation of retarded action at a distance, is suggested. (auth)

13612

ROTATIONAL PROPERTIES OF THE TWO-DIMENSIONAL ANISOTROPIC HARMONIC OSCILLATOR. II. THE COLLECTIVE-INTRINSIC DESCRIPTION. H. J. Lipkin and S. Goldstein (Weizmann Inst. of Science, Rehovoth). Nuclear Phys. 7, 184-94(1958) June (2).

Harmonic oscillator wave functions are examined from the point of view of the collective rotational motion characteristic of the unified nuclear model. As oscillatory collective rotation is defined. Conditions are formulated for the separability of this motion from the other degrees of freedom of the system. Separability is demonstrated to good approximation in systems of large numbers of particles with large deformations. (auth)

13613

NOTE ON EFFECTIVE RANGE THEORY. N. Austern (Univ. of Sydney). Nuclear Phys. 7. 195-201(1958) June (2).

It is shown that the basic formula of effective range theory may be derived from the orthogonality of wave functions. The results of this theory therefore are not limited in their application to systems which can be described by a phenomenological Schrödinger equation. Some discussion is given of n–p scattering with tensor forces. of the Bethe-Longmire theory of deuteron photodisintegration, and of partial waves of angular momentum greater than zero. It is remarked that the Bethe-Longmire result for the electric dipole photodisintegration may be derived without any consideration of the nature of the neutron-proton interaction. (auth)

13614

CLOTHED PARTICLE OPERATORS IN SIMPLE MODELS OF QUANTUM FIELD THEORY. O. W. Greenberg and S. S. Schweber (Brandeis Univ., Waltham, Mass.). Nuovo cimento (10) 8, 378-406(1958) May 1.

The idea of using clothed operators in the quantum theory of fields, i.e., operators which create and annihilate one particle eigenstates of the total Hamiltonian. is examined. In cut-off theories. these clothed operators are related to the unrenormalized Schrödinger picture operators by a similarity transformation. In terms of these clothed operators the virtual cloud of particles surrounding a physical particle appearing in present discussions of field theory no longer appears. corresponding to the elimination. in the terminology of Van Hove, of persistent effects. Mass and wave function renormalization are automatically accomplished by unitary clothing transformations. and the usual renormalization program is extended to the renormalization of the states appearing in the theory. The form of the Hamiltonian expressed in terms of clothed operators is discussed and these ideas are applied to the static scalar model, the Lee model. and the Ruijgrok-Van Hove model. (auth)

13615

ON A GEOMETRICAL THEORY OF THE ELECTROMAGNETIC FIELD. D. W. Sciama (Trinity Coll., Cambridge. Eng.). Nuovo cimento (10) 8, 417-31(1958) May 1.

Weyl's (1929) geometrical theory of gauge (phase) transformations for fermions and the electromagnetic field is generalized so as to apply to bosons as well. This is done by introducing complex base vectors. The resulting theory is closely related to the Einstein-Schrödinger theory in its Hermitian form. and enables one to identify the electromagnetic field tensor. Two physical consequences are deduced from the theory: (a) The charges of all bosons are integer multiples of a

basic charge. (b) The direct interaction between a particle and the electromagnetic field is invariant under space reflections and time reflections. A theoretical criterion is suggested (based on the argument leading to b)) for determining which interactions are parity conserving. (auth)

13616

RELATIVISTIC CALCULATION OF THE IMAGINARY PART OF RADIOACTIVE LEVEL DISPLACEMENT FOR THE HYDROGEN ATOM. L. Kaagjärv and S. T. Ma (Univ. of Sydney). Nuovo cimento (10) 8, 432-40 (1958) May 1.

A relativistic calculation of the imaginary part of the radiative displacement of excited levels of the hydrogen atom is given. A quantum-electrodynamical expression for the self-energy of a bound electron is given which has been used in the latest calculation of the Lamb shift. The imaginary part of this self-energy is considered to the same degree of accuracy as the Lamb shift. The results for the 2S and 2P levels are compared with the non-relativistic results calculated along the lines of a well known paper by Weisskopf and Wigner. It is found that there are no relativistic corrections to the desired order of accuracy. (auth)

13617

TWO COMPONENTS SPINOR EQUATION. R. Ascoli (Univ. of Turin). Nuovo cimento (10) 8, 501-5(1958) May 1.

It is shown that the neutrino equation may be separated into two-component equations and that it is possible to write a spinor equation having the property of the neutrino equation. Therefore, it seems possible to write a non-linear two-component spinor equation, provided the spinor field is quantized with anticommutators. (A.C.)

13618

POSSIBLE CONNECTION BETWEEN STRANGENESS AND PARITY. Feza Gürsey (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 98-100 (1958) Aug. 1.

A connection between strangeness and parity is conjectured in such a way that predictions become possible on the relative parities of strongly interacting particles. (W.D.M.)

13619

EXPERIMENTAL LIMIT OF THE NEUTRINO REST MASS. Lewis Friedman (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. Letters 1, 101-2(1958) Aug. 1.

An empirical determination of the neutrino rest mass can be obtained from the H^3-He^3 mass difference and the H^3 β end-point energy. If the experimental lower limit of the true β end point is subtracted from the H^3-He^3 mass difference, the result is an empirical upper limit for the neutrino rest mass. This upper limit is independent of any theory of beta decay and requires only the assumption of conservation of mass and energy. (W.D.M.)

13620

BETA-NEUTRINO-ALPHA DIRECTIONAL CORRELATION. M. Morita (Columbia Univ., New York). Phys. Rev. Letters 1, 112-14(1958) Aug. 1.

The decay involving a beta-alpha cascade is treated. The beta-neutrino-alpha directional correlation is immediately derived from the beta-neutrino-gamma angular correlation. The result for allowed beta transitions in the decay scheme $j(\beta)j_1(\alpha)j_2$ is given. (W.D.M.)

13621

TIME REVERSAL AND THE RELATION BETWEEN ANGULAR DISTRIBUTIONS OF ABSORPTION AND EMISSION PROCESSES. R. Huby (Univ. of Liverpool). Proc. Phys. Soc. (London) 72, 97-102(1958) July.

A simple rule is given for modifying the formula for the angular distribution of any process, however complicated, which involves absorption of a particle (or radiation) p in the transition stage $p + A \rightarrow B$ so as to yield the angular distribution of the process which differs only in the replacement of the absorption stage by an emission stage $A \rightarrow p + B$. The time-reversal operation is involved, and one is led to the time-reversal of density and efficiency matrices, and of statistical and efficiency tensors. (auth)

13622

CONCERNING A MODEL FOR A NON-IDEAL FERMI GAS. A. A. Abrikosov and I. M. Khalatnikov (Inst. of Physical Problems, Academy of Sciences, USSR), Soviet Phys. JETP 6, 888-92(1958) May.

The energy of the ground state and the effective mass of the excitations are found for a non-ideal Fermi gas with short-range forces, the radii of action of which are small in comparison with the average wavelength. (auth)

13623

THE QUANTUM STATES OF PARTICLES COUPLED WITH ARBITRARY STRENGTH TO A HARMONICALLY OSCILLATING CONTINUUM. II. THE CASE OF TRANSLATIONAL SYMMETRY. V. M. Buimistrov and S. I. Pekar (Physics Inst., Academy of Sciences, Ukrainian SSR). Soviet Phys. JETP 6, 977-80(1958) May.

The method developed in the preceding paper (Soviet Phys. JETP 5, 970(1957)) is extended to the case of a system with translational symmetry (there is no external potential field and the particle is not localized). The variational method is used to calculate the lowest energy levels and wave functions of the system described by the Hamiltonian of the equations $H = (\hbar^2/2m)\Delta + \frac{1}{2}\sum_\kappa \hbar\omega_\kappa (q_\kappa^2 - \partial^2/\partial q_\kappa^2) + \sum_\kappa c_\kappa q_\kappa \chi_{-\kappa}(r)$ and $\chi_\kappa(r) = \sqrt{2/V}$ $\sin(\kappa r + \pi/4)$. This method is applied to the polaron problem. In the limiting cases of weak and strong coupling between the particle and oscillations the calculated energy agrees with the exact result of perturbation theory (in the second approximation) and approaches. Feynman's result for strong coupling. (auth)

13624

SATURATION EFFECT IN A SYSTEM WITH THREE ENERGY LEVELS. V. M. Fain (Gorkiy Radiophysics Research Inst.). Soviet Phys. JETP 6, 991-5(1958) May.

The response of a system with three levels (E_1, E_2, and E_3) to an alternating field with harmonics $\omega_{31} = (E_3 - E_1)/\hbar$, $\omega_{21} = (E_2 - E_1)/\hbar$, and $\omega_{32} = (E_3 - E_2)/\hbar$ is examined. An expression which can be used in the theory of quantum oscillators or amplifiers, is derived for the dielectric constant (or magnetic permeability). (auth)

13625

ON THE USE OF THE DISPERSION IN ENERGY AS A CRITERION FOR THE ACCURACY OF THE VARIATIONAL METHOD. D. P. Leper and D. S. Chernavskii (P. N. Lebedev Physics Inst., Academy of Sciences, USSR). Soviet Phys. JETP 6, 1009-10(1958) May.

The accuracy of a solution of the Schrödinger equation by the variational method is usually estimated by comparing the calculated energy value with its experimental value. The error in the energy obtained in this way can reflect not only the inaccuracy of the trial

function. but also the inaccuracy of the Hamiltonian. It is shown that the magnitude of the error due to the inaccuracy of the trial function can be estimated by using the dispersion in the energy of the trial functions. (J.S.R.)

13626

ON THE MOTION OF ROTATING MASSES IN THE GENERAL THEORY OF RELATIVITY. A. P. Ryabushko and I. Z. Fisher (Belorussian State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1189-94(1958) May. (In Russian)

The relativistic equations for translational and rotational motion of spherically symmetric rotating bodies are integrated. Some novel relativistic effects due to the proper rotation of the bodies were detected and are discussed. (tr-auth)

13627

RADIATIVE CORRECTIONS TO COMPTON SCATTERING WITH ACCOUNT OF POLARIZATION OF THE MEDIUM. M. I. Ryazanov (Moscow Inst. of Engineering Physics). Zhur. Eksptl'. i Teoret. Fiz. 34, 1258-66 (1958) May. (In Russian)

A general procedure is developed which permits one to take into account the polarization of the medium in calculating radiative corrections in phenomenological quantum electrodynamics. The effect of a nonconducting medium on radiative corrections for Compton scattering is taken into account for an arbitrary dependence of dielectric permeability of the medium on the frequency It is shown that in some cases considerations of the medium significantly change the cross section in the region of small scattering angles. (tr-auth)

13628

PHOTON WAVE EQUATIONS. A. A. Borgardt (Dnepropetrovsk State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 34, 1323-5(1958) May. (In Russian)

A matrix wave equation for photon was formulated with the aid of the 8th and 4th series of Dirac algebra. Two new magnitudes, scalar ψ and pseudoscalar ψ, are used in the wave function. (R.V.J.)

13629

THE SPIRALING OF A CHARGED PARTICLE. Martin Kruskal (Princeton Univ., N. J.). pp. 562-8 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica.

Equations are derived which describe the nonrelativistic motion of a charged particle in the "guiding-center" approximation. The guiding center approximation applies when the trajectory of the particle forms approximately a tight spiral. (J.S.R.)

13630

GENERAL SOLUTION OF THE BOLTZMANN TRANSPORT EQUATION IN THE PRESENCE OF AN EXTERNAL ELECTROMAGNETIC FIELD AND ITS APPLICATIONS TO THE PROCESSES OF INELASTIC COLLISIONS, TO THE CONDITIONS OF DISCHARGE IN A CAVITY, AND TO PROGRESSIVE WAVES IN THE LORENTZ PLASMA. R. Jancel and T. Kahan (Institut H. Poincaré, Sorbonne). pp. 569-77 in "Terzo Congresso Internazionale Sui Fenomeni D'Ionizzazione Nei Gas, Rendiconti, Venice, June 11-15, 1957." Milan, Società Italiana di Fisica. (In French)

A general solution is obtained for the Boltzmann transport equation in the presence of an external electromagnetic field. The general solution is applied to the problems of progressive wave propagation in a plasma in the presence of a magnetic field, interaction of electromagnetic waves in a non-homogeneous medium, and formation of stationary waves in a guide or cavity by consideration of the limiting condition and the processes of charge creation which maintain the discharge. (J.S.R.)

Tracer Applications

13631 AERE-I/R-759

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

DEVELOPMENT OF A METHOD OF DETECTING LEAKS IN THE SHEATHING OF TELEPHONE CABLES BY THE USE OF RADIOACTIVE MATERIALS. L. W. Hill. July 20, 1951. 18p.

Development of a method of detecting leaks in the sheathing of telephone cables up to the point at which extensive field trials are necessary is described. The choice of radioactive materials is limited by various factors to two substances. The use of the more convenient of these is examined experimentally. Results indicate that the technique is at least as sensitive as, and much quicker than, the method at present in use, in which air is pumped into a cable and the fall in pressure after a given time is measured. (auth)

13632

THE TRAVEL TIME OF RADIOACTIVE WASTES IN NATURAL WATERS. G. T. Bryant and J. C. Geyer (Johns Hopkins Univ., Baltimore). Trans. Am. Geophys. Union 39, 440-5(1958) June.

Past studies of mixing and movement are drawn on to depict the time and space distribution of radioactive contaminates in natural waters. Tracer studies offer means for evaluating mixing and travel time which may in turn be used to forecast the fate of wastes continuously disposed of in water. (auth)

Uranium and Uranium Compounds

13633 AERE-M/R-741

Gt. Brit. Atomic Energy Research Establishment, Harwell, Berks, England.

EFFECT OF IRRADIATION ON THE HARDNESS OF ALPHA-URANIUM. P. E. Madsen. July 1951. Decl. Jan. 11, 1956. 15p.

Further irradiations of samples from the original uranium used in earlier work show that at a flux of 10^{11} neutrons/cm^2/sec cold-worked uranium softens and annealed uranium hardens Both worked and annealed specimens from fresh uranium sheet show a drop in hardness on the first irradiation in a flux of 10^{11} neutrons/cm^2/sec. Further irradiation causes the hardness of the worked specimens to vary within a band of 14 Brinell, while the annealed specimens show a significant though slight hardening with time. This behavior was compared with the effect of annealing unirradiated material at 150°C from which it is concluded that the behavior of uranium under irradiation cannot be entirely explained by the heating effect produced by irradiation. Annealing experiments show that the hardness induced by irradiation is stable at 150°C but can be removed at 220°C. The results are consistent with the view that the hardness changes in uranium on irradiation are the net effect of the competing processes, hardening by atom disturbance from normal sites and thermal recovery. (auth)

13634 TID-5345

Carbide and Carbon Chemicals Co. [K-25 Plant], Oak Ridge, Tenn.

VARIATION OF CERTAIN CRITICAL PARAMETERS WITH ASSAY. L. Geller. Nov. 20, 1952. Decl. June 3, 1958. 9p. Contract [W-7405-eng-26]. (KS-336). $1.80(ph OTS); $1.80(mf OTS).

New data from the 5% critical experiments were used to determine the variation of certain minimum critical parameters with the U^{235} assay. Curves are presented showing the minimum mass, volume, and cylinder diameter of U^{235} as functions of the assay. (W.D.M.)

13635

DOSIMETRIC CHARACTERISTICS OF THE RADIATION FROM FISSION FRAGMENTS IN URANIUM. K. K. Aglintsev. A. N. Gorobets, V. P. Kasatkin, and E. S. Kondakova. Atomnaya Energ. 4, 461-4(1958) May (In Russian)

Calculations were made of various dosimetric characteristics of fission fragments: the content of the mixture in % during the irradiation of uranium for t_0 = 100 days, with the cooling period τ = 15 to 540 days, and the variations in the time activity of the mixture for 60, 100, and 150 days. Calculations are in good agreement with the results of radiochemical analysis. The mixture constant does not depend on t_0 (within the limits of 60 to 150 days and remains approximately constant in a τ range of 15 to 180 days). (tr-auth)

13636

FILAMENTARY GROWTH IN IRRADIATED URANIUM. W. M. Barss (Atomic Energy of Canada, Ltd., Chalk River, Ont.) and Z. S. Basinski and F. R. N. Nabarro (National Research Council, Ottawa, Ont., Can.). Can. J. Phys. 36, 980-3(1958) July.

In the spaces left by transverse fracture of U rods being irradiated in reactors, dense filaments of U up to 5 cm long have been observed projecting from the uranium. Arguments against mechanical or thermal origin of these "whiskers" are presented, and support is offered for the vacancy or interstitial atom growth idea. A creep mechanism is also discussed. (T.R.H.)

13637

THE DIFFUSION OF FISSION XENON IN URANIUM OXIDE. Fred Felix (Institut für Kernforschung, Berlin). Nukleonik 1, 66-7(1958) July. (In German)

Measurements were made of the diffusion of fission xenon in uranium oxide in the form of thin layers, powders, and tablets. The preparations were irradiated in a neutron flux of approximately 10^{11} neutrons/cm^2 sec for various lengths of time. The xenon content of the oxide samples was determined as a function of temperature. It was shown that the xenon is independent of the sample form and quite dependent on the temperature. (J.S.R.)

13638

URANIUM FISSION PRODUCTS IN THE RARE EARTH ELEMENT REGION OBTAINED BY IRRADIATION WITH 660 Mev PROTONS. F. I. Pavlotskaya and A. K. Lavrukhina (Inst. of Geochemistry and Analytical Chemistry, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 34, 1058-69(1958) May. (In Russian)

Data obtained by a radiochemical method are presented for the fission products of uranium produced in the rare earth region by irradiation with 660 Mev protons. The total rare earth element yield was 0.7×10^{-24} cm^2 which is about 20% of the yield of all fission fragments. When the fission is strongly asymmetric the yields of stable isotopes and also isotopes with an excess or deficiency in neutrons are approximately equal. Maximal yield of light rare earth elements is observed in the region of nuclear stability; the heavy rare earth fission products are predominantly neutron deficient isotopes. It is shown that the distribution of rare earth elements observed under natural conditions cannot be explained by heavy nucleus fission induced by high energy particles. (tr-auth)

PERSONAL AUTHOR INDEX

This is an index for the reports abstracted in this issue. For each reference the number preceding the dash is the volume number and the number after the dash is the abstract number. Personal author indexes are cumulated on a semiannual and annual basis.

A

ARRIKOSOV A A
12-13622
ARROSIMOV A T
12-13216
ACKERMANN M
12-13308
ACTON E W V
12-13551
ADAMSON G M
12-13177
AGARWAL SOM PRAKASH
12-13215
AGENA HELMUT H
12-13104
AGLINTSEV K K
12-13635
AGODI A
12-13402
AKHIYEZER A I
12-13408
AKOLZIN P A
12-13118
ALBAUGH F W
12-13470
ALBRECHT W L
12-13462 12-13463
ALEKSEEV A I
12-13411 12-13584
ALEXANDER LAURENCE P
12-13190
ALEXANDROV I V
12-13396
ALGER J V
12-13117
ALIKHANOV A I
12-13440
ALIKHANYAN A I
12-13357
ALLEN J E
12-12901 12-13241
ALLEN K W
12-13240
ALLEN T K
12-13242
ALPERS V V
12-13333
ALYAVDINA L A
12-13026 12-13063
AMEMIYA AYAO
12-13032
AMMANN P R
12-13035
AMOUYAL A
12-13477
AMPHLETT C B
12-13105
ANDERSON G A
12-13451
ANDERSSON R
12-13593
ANDREWS R C
12-13081
ANICETTI R J
12-13073
ANKE KLAUS
12-13520
ANTONEVA N M
12-13424
APPEL H
12-13439
ARNOLD E D
12-13529
ARNOLD J W
12-13189
ARSAC
12-13296
ASCOLI R
12-13617
ASIRE DONALD HENRY
12-13487
AUST K T
12-13221
AUSTERMAN S B
12-13012
AUSTERN N
12-13613
AVOTINA M P
12-13420
AXTMANN ROBERT C
12-12974
AYVAZYAN M I
12-13212

B

BACH SVEN A
12-12913
BAEHR HANS DIETER
12-13504
BAERG A P
12-13535
BAGGETT LEE JR
12-13344
BAILEY G C
12-13142
BAINBRIDGE G R
12-13277
BALLOU J E
12-12965
BANERJEE HARIDAS
12-13289
BARASHENKOV V S
12-13346
BARBE R W
12-13499
BARBER J C
12-13119
BARELKO E V
12-13025
BARKAS WALTER H
12-13391
BARKER BERTON E
12-13317
BARKER F B
12-13594
BARKER J A
12-12911
BARNES E
12-13072
BARNES R G
12-13185
BARON V V
12-13160
BARSHAY SAUL
12-13350
BARSS W M
12-13466 12-13636
BASHILOV A A
12-13424 12-13430
BASINSKI Z S
12-13636
BAUM V A
12-13098
BAYET M
12-13296
BECK A H
12-13304
BECK CHRISTIAN
12-13444
BECKER R L
12-13592
BEELER J R JR
12-13309 12-13310
BEETEM W A
12-13181
BELAMIN MICHAEL
12-13520
BELFOUR A J
12-13078
BELIN P
12-13525
BELL L G
12-13107
BELLAMY R G
12-13069
BELLWARE M D
12-13178
BELOVITSKIY G YF
12-13334
BELTRAMETTI E G
12-13565
BENGSTON JOEL
12-13389 12-13531
BENNETT DWIGHT G
12-12971
BENNETT F G IV
12-13002
BENOIST P
12-13477
BERGEDER HANS-DIETRICH
12-12940
BERKL K
12-13523
BERKLEY KELLY M
12-12916
BERKOVSKII A G
12-13300
BERLINCOURT DON
12-13108
BERNDTSON CHARLES R
12-13598
BERTRAM CLAUS
12-12934
BETTENDORF GERHARD
12-12932
BETZ J R
12-13081
BEVILACQUA F
12-13017
BEVIS K S
12-13057
BICKERTON R J
12-13234 12-13243
BIERMANN L
12-13244
BIGELOW W C
12-13138
BINCER A
12-13591
BLASSER G
12-13380
BLOEMBERGEN N
12-13438
BLOKHINTSEV D I
12-13510
BLOMGREN R A
12-13017
BLOOM M C
12-13115
BLOOM S D
12-13439
BLUMBERG E A
12-13027
BODIN H A B
12-13240
BODO Z
12-13319
BOKHARI M S
12-13543
BOKHNATSKI Z
12-13426
BOLOTIN L I
12-13571
BOLT S E
12-13113
BOND R H
12-13079
BONNAURE P
12-13526
BORGARDT A A
12-13628
BORISHANSKII V M
12-13095
BOSTICK WINSTON H
12-13388
BOTNER W T
12-13189
BOWING GUNTHER
12-12936
BOWRING R W
12-12970
BRADLEY D C
12-12985
BRADLEY RICHARD C
12-13133
BRAFFORT P
12-13527
BRAININ I E
12-13163
BROKHIN I S
12-12989
BROOKSBANK W A JR
12-13008
BROUDE V L
12-13222
BROWN ERNEST A
12-12998
BROWN F
12-13535
BROWN G E
12-13405
BROWN ROBERT D
12-13512
BROWN SANBORN C
12-13245
BRUCER MARSHALL
12-12959
BRYANT G T
12-13632
BUDBERG P B
12-13155
BUDDERY J H
12-13069
BUIMISTROV V M
12-13623
BUJDOSO E
12-13129
BUKHTEEV A M
12-13294
BUPP L P
12-13470
BURGER L L
12-13042
BURKETT J
12-13170
BURKHARDT G H
12-13354
BURNETT R C
12-13132
BUXTON S R
12-13113
BYDIN YU F
12-13294

C

CAHAN BORIS D
12-13123
CAILLET C
12-13527
CALDER NIGEL
12-13515
CANNON BRANFORD
12-12913
CANONICO DOMENIC
12-13139
CARPENTER HARRY M
12-12922
CARTER EDWIN L
12-12913
CARTER R J
12-13008
CARTER R L
12-13482
CASS JULES
12-12963
CASSELS J M
12-13354
CAVALLO LUCY M
12-13587
CHACE WILLIAM G
12-13274
CHALMERS B
12-13221
CHANDRASEKHAR S
12-13235
CHAPIN S
12-13184
CHAPLYGINA E M
12-13154
CHAPMAN R H
12-13457
CHEN PHILIP S JR
12-13001
CHENOT M
12-13246
CHERNAVSKII D S
12-13625
CHERVINSKAYA L S
12-13430
CHESS ROBERT
12-12966
CHEVERTON R D
12-13459
CHIKOVANI G E
12-13358
CHIKOVANI N N
12-13222
CHINAGLIA B
12-13588 12-13589
CHRISTMAN R G
12-13491
CHRISTOFFEL R J
12-13175
CHUBINSKII O V
12-13433
CHURAYEV N V
12-12987
CHURCH E
12-13591
CHUVILO I V
12-13578
CLARK J C
12-13496
CLARK L H
12-13042
CLARK M A
12-13381
CLARK R T
12-12999
CLAY P G
12-13028
CLEVELAND FRANK
12-12963
CLEVENGER GALEN W
12-13056
COCKCROFT JOHN
12-12900 12-12902
COEN I H
12-13499
COLLINS H L
12-13457
COLNER WILLIAM H
12-13124
COLOMBINO P
12-13566
CONARD ROBERT A
12-12913
CONGDON C C
12-12949 12-12953
COOKSON J A
12-13543
COOPER W A
12-13213
CORENZWIT E
12-13597
CORNEY N S
12-13024
CORRIGAN J J
12-13214
CORTELLESSA G
12-13352
COSTE
12-13296
COWAN F P
12-12946

CULLINGTON EDMUND H
12-13274
CULVER H N
12-13464
CURRAN R M
12-13175
CURRAN S C
12-13240
CZYZ W
12-13534

D

DABROWSKI JANUSZ
12-13407
DAHLEN ALLAN
12-12981
DAMASCHKE K
12-13030
DANIELS FARRINGTON
12-13066
DANILENKO D A
12-13118
DANNO AKIBUMI
12-13032 12-13033
12-13034
DATTNER ADAM
12-13247
DAVIES R H
12-12970
DAVIES T A
12-13260
DAVIS ALVIN H
12-13208
DAVIS L A
12-13062
DAVIS W KENNETH
12-13085
DAVYDOV A S
12-13574
DAWES C
12-13168
DAYTON RUSSELL W
12-12972 12-13135
DE BENEDETTI S
12-13566
DE CARVALHO RODRIGO A G
12-13059
DE DOMINICIS C T
12-13405
DE MARRAIS G A
12-13368
DE NORDWALL H J
12-12969
DECKER ALFRED
12-13518
DECKER DANIEL L
12-13186
DECKER R F
12-13138
DEDOV V B
12-13421
DEGREGORI I
12-13566
DEIGEN M F
12-13228
DELCROIX J
12-13296
DELORE N L
12-12919
DEMICHELIS F
12-13588 12-13589
DENISSE J
12-13296
DEPACKH D
12-13248
DESAUSSURE G
12-13476
DESHONG J A JR
12-13450
DESOV A YE
12-13600
DEUTSCH D E
12-13140
DICKER GORDON K
12-13326
DICKINSON R W
12-13481
DIETRICH J R
12-13451
DISMUKE S E
12-13017
DLBRYNIN YU P
12-13417
DMITRIEV A G
12-13425
DMITRIEV V A
12-13216
DODERLEIN J M
12-13471
DOHERTY D G
12-12949
DOKE TADAYOSHI
12-13539
DOLLARD W J
12-13457
DOLLEKHAL N A
12-13510
DOMINA F H
12-13175
DOSE KLAUS
12-12938
DOYLE C D
12-12977
DRICKAMER H G
12-13006
DROWART J
12-13308
DROZDOV S I
12-13579
DUANE B H
12-13453
DUBININ M M
12-13303
DUCHENE J P
12-13342
DUFFY N H
12-13018
DUGGAN H G
12-13017
DUNCAN D S
12-13376 12-13472
DUNWORTH J V
12-13503
DWYER L J
12-12945
DZHELEPOV B A
12-13432
DZHELEPOV B S
12-13422 12-13423
12-13424 12-13425
12-13430 12-13433
DZHELEPOV V P
12-13573

E

ECKER G
12-13249
EDELS H
12-13250
EDWARDS J W
12-12994
EDWARDS M H
12-13198
EDWARDS W F
12-13311
EFIMOV YU V
12-13160
EFROS I A
12-13585
EHRENBERG WOLFGANG
12-13239
EHRENTREICH JOACHIM
12-13505
EICHER MAYNARD
12-12913
EIDINGER A
12-13251
EISENBUD MERRIL
12-12962
EISENHAUER ROBERT A
12-13056
EKLUND SIGVARD
12-13502
EL AGGAN A M
12-12985
EL NADI MOHAMED
12-13577
ELISEEV G P
12-13440
ELLERHORST ROBERT H
12-13053
ELLIOTT J P
12-13406
ELLIS O B
12-13121
EMANUEL N M
12-13027
EMELEUS K G
12-13252
ENGLISH J L
12-13113
EREMENKO V V
12-13222
ERGEN W K
12-13458
ERMOLOV P F
12-13433
EUGENIO MANUEL R
12-13038
EVANS C
12-13377
EYLER J M
12-13497
EYRING HENRY
12-13199

F

FACHIN U
12-12993
FAIN V M
12-13624
FALKOVSKII V B
12-12980
FEDERBUSH P
12-13383
FEDORUF Z P
12-13204
FEDUSKA A
12-13117
FEDYANIN V K
12-13562
FEDYNSKIY O S
12-13098
FELIX FRED
12-13637
FENTON A G
12-13211
FENTON K B
12-13211
FERGUSON K R
12-13017
FERNELIUS W CONARD
12-13062
FESSLER H
12-13152
FETNER CHARLES J
12-13070
FIENO D
12-13457
FIGENSHAW J K
12-13017
FIGG W S
12-13088
FILIMONOV V A
12-13367
FILIPPOV G F
12-13574
FILLNOW R H
12-13017
FILONOV V A
12-13130
FILTHUTH H
12-13213
FINDLAY J R
12-13067
FINKEL E E
12-13192
FINKELSHTEYN YA B
12-13130
FISHER I Z
12-13626
FISHER L H
12-13253
FISHER M E
12-13320
FITCH R A
12-13240
FLEISCHMANN W L
12-13528
FLETCHER J G
12-13321
FLIEDNER THEODOR M
12-12954
FLOWERS R H
12-12969
FLUIT J M
12-13207
FOGH J
12-12917
FOLIN O
12-12910
FOLTZ H L
12-13087
FOSBERG M A
12-13183
FRANCIS GORDON
12-13254
FRANCIS HOWARD T
12-13124
FRANK P W
12-13498
FRANKHOUSER W L
12-13497
FRASER A R
12-13202
FREEMAN J W
12-13138
FREEMAN RICHARD
12-12966
FRENCH A P
12-13558
FRENCH S J
12-13531
FRIEDMAN LEWIS
12-13619
FROHLICH H
12-13397
FUCKS W
12-13255
FUNKE V F
12-12989

G

GAROVICH M D
12-13204
GALOVIN B M
12-13573
GARDNER W J
12-13018
GARTON V R S
12-13256
GAST P F
12-13470
GAUWERKY FRIEDRICH
12-12927
GELD P V
12-13127
GELLER L
12-13634
GELLER W
12-13149
GENGOZIAN N
12-12953
GERCKE R H J
12-13485
GESHKENBEIN B V
12-13546
GEVANTMAN L H
12-13325
GEYER J C
12-13632
GIBB CLAUDE
12-12903
GIBSON A
12-13258
GIFFORD J F
12-13017
GILL J J
12-13013
GILLESPIE ARTHUR S JR
12-12986
GLASGOW L E
12-13479
GLATTER J
12-13497
GLAZOV V M
12-13162
GOERTZ R C
12-13017
GOLDBERG B
12-13311
GOLDBERG D F
12-13062
GOLDBERGER M L
12-13383
GOLDEMBERG J
12-13542
GOLDFINGER P
12-13308
GOLDIE HORACE
12-12966
GOLDIN L L
12-13421
GOLDMAN MARVIN
12-12915
GOLDMANN KURT
12-13443
GOLDSTEIN L
12-13257
GOLDSTEIN S
12-13612
GOLIK M A
12-13491 12-13492
12-13493
GOLOVIN V N
12-13334
GONCHAROV V V
12-13014
GONZALES P R
12-13449
GOODLET L J
12-13193
GORBUNOVA I M
12-12920
GORDON GLEN E
12-13532
GORDY WALTER
12-12968
GORNYI N B
12-13290
GOROBETS A N
12-13635
GORYUNOV N N
12-13216
GOURDIN M
12-13401
GRACE J N
12-13495
GRAF L
12-13255
GRAMOLIN V A
12-13338
GRATSIANSKII N N
12-13126
GREELEY R S
12-13113
GREEN F P
12-13460
GREENBERG O W
12-13614
GREENBERG S A
12-13491
GREGORY J N
12-13067
GREINACHER H
12-13298
GRIBOV V N
12-13322
GRIESS J C
12-13113
GRIFFIN L R
12-13260
GRIGOREV E P
12-13422 12-13538
GRIGOREV YE L
12-13356
GRIGORIEV E L
12-13382
GRIGORIEV E P
12-13420
GRISHIN V G
12-13578
GROH HAPOLD J
12-13041
GROMOV K YA
12-13425
GROTH W
12-13307
GRUMM H
12-13232
GRUNEWALD HORST
12-13596
GUON J
12-13018
GUREVICH S G
12-13318
GURKE G
12-13255
GURSEY FEZA
12-13618
GUSTOVA L V
12-13433
GVOZDANOVIC D D
12-13205

H

HAEBLER DIETRICH V
12-13519
HAIN K
12-13744 12-13261
HAINES D J
12-13152
HALBIG JOHN
12-13121
HANNAN R S
12-12912
HANSBURY E
12-12975
HANSEN W C
12-13110
HARDER DIETRICH
12-12928
HARLOW FRANCIS H
12-13313
HARMAN T C
12-13187
HARRER J M
12-13451
HARRIS D M
12-13106
HARRIS SAUL J
12-13086
HARTSOUGH WALTER D
12-13548
HARTWEG HELMUT
12-12936
HASLAM R N H
12-13419
HAUFFE K
12-12979
HAUSEN HELMUTH
12-13093
HAUSER S M
12-13415

HAY J S
12-12992
HAYES F N
12-12975
HEARD HARRY G
12-13547
HECHTER HYMAN
12-12913
HECKMANN ULRICH
12-12930
HELMBRECHT H L
12-13491
HEMMINGS R F
12-13262
HENKE HEINZ
12-12929
HERMANSON C A
12-13017
HERNANDEZ-FRAGOSO J
12-13457
HERRMANN R G
12-13309 12-13310
HESS D N
12-13113
HESS H H
12-13077
HEUS R J
12-13039
HEYDA JAMES F
12-13318
HEYMANN F F
12-13560
HEYMANN HANS-JOACHIM
12-13337
HICKS CLARK T
12-13045 12-13046
12-13047 12-13048
12-13049 12-13050
12-13051 12-13052
HIGGINS J K
12-13037
HILL DOUGLAS G
12-12986
HILL J A
12-12977
HILL L W
12-13631
HILL N A
12-13131
HILL R D
12-13590
HINTON CHRISTOPHER
12-12899
HIRAO YASUO
12-13586
HIRD B
12-13543
HITTMAIR O
12-13393
HOBSON J D
12-13000
HOCKER K H
12-13263
HOENIG A
12-13101
HOHNE GUNTER
12-12934
HOK K A
12-12917
HOLDEN F C
12-13143
HOLEMAN J M
12-13017
HOLLANDER J M
12-13306
HOLLANDER LEWIS E JR
12-13330
HOLLISTER EZRA
12-13017
HORN F H
12-13003
HORNAK J N
12-13165
HORNYKIEWYTSCH THEOPHIL
12-12926
HORST WOLFGANG
12-13337
HORTON A WESLEY
12-12963
HORTON R H
12-13017
HOWE L M
12-13107
HOWERTON R J
12-13531
HUBER D A
12-13524
HURY R
12-13621
HUG OTTO
12-12928
HUNTER J R
12-13116
HUSEBY R A
12-13176
HUTCHINSON W P
12-13323
HYLER W S
12-13078

I

INGLES O G
12-13020
IOFFE B L
12-13365 12-13595
IRVINE K J
12-13169
ISHIWATARI KEIKO
12-13223
ISOYA AKIRA
12-13540 12-13541
ISRAEL H
12-13371
IVANOV O S
12-13158
IVANTER I G
12-13359
IYAPKIN A A
12-13355

J

JACKSON T M
12-13304
JAEGER THOMAS
12-13075
JAKOBSON K
12-13491
JAKSIC B
12-13349
JAMES D G L
12-13029
JAMESON A S
12-13451
JANCEL R
12-13630
JANCOVICI B
12-13401
JANNER KARL
12-13521
JENTSCHKE W
12-13549
JEUNEHOMME M
12-13308
JOHNSON G R A
12-13028
JOHNSON W E
12-13017
JONES DAN S
12-13489 12-13490
JONES F LLEWELLYN
12-13268
JONES R T
12-13582
JONES SAM
12-12991
JORDAN H L
12-13266
JORDAN J V
12-13183
JOVER P
12-13525
JUDD W C
12-13100
JUNKERMANN W
12-13517

K

KAAGJARV L
12-13616
KABAKCHI A M
12-13338
KAGANOV M I
12-13172
KAHAN T
12-13630
KALCKAR HERMAN M
12-12951
KALMUS P I P
12-13560
KALUSCHE HEINRICH
12-13522
KALUZHNAYA P E
12-13126
KANELLOPOULOS TH
12-13398
KANZIG WERNER
12-13583
KAPLAN H J
12-13491
KARASEV R A
12-13157
KARTASHEVA L I
12-13025
KASATKIN V P
12-13635
KATO SUSUMU
12-13331
KATZMAN J
12-13210
KAUFMAN A N
12-13235
KAVTARADZE N N
12-13061
KAWAGUCHI M
12-13201
KAWAMURA HAZIMU
12-13223
KAYLOR C T
12-12967
KAYSER L
12-13103
KAZARINOV YU M
12-13572
KAZIMIROVSKAYA YE L
12-13125
KEAM D W
12-12945
KEPPLER J G
12-13375
KERR V N
12-12975
KETZLACH NORMAN
12-13469
KHALATNIKOV I M
12-13622
KHALKIN V A
12-13545
KHARCHENKO V A
12-13163
KHASIN G A
12-13174
KHERSHKOIRCH
12-13150
KHLAPOVA A N
12-12984
KHOLNOV YU V
12-13429
KHRENOV B A
12-13216
KHRISTIANSEN G B
12-13216
KHUNYUAN CHZHU
12-13608
KIDDER R E
12-13390
KINYON BRICE W
12-13017
KIRCHER J F
12-13324
KIRILLOV-UGRYUMOV V G
12-13357
KIRK H J
12-13494
KISSLINGER L S
12-13386
KISTEMAKER J
12-13207
KLAHR CARL
12-13474
KLEIN A
12-13348
KLINE S ALLAN
12-13140
KLOPFENSTEIN ROBERT K
12-13053
KLUGE W
12-13264
KLYUCHAREV A P
12-13571
KNIGHT H A
12-13090
KNOWLES D J
12-13314
KNUDSEN MARTIN
12-13292
KOBZAREV I YU
12-13366
KOCH EBERHARD
12-12926
KOCH L
12-13265
KOCH RUPRECHT
12-12956
KOCHAROV G E
12-13441
KOLIVERDOV V F
12-13102
KOLODEZNYI B A
12-13118
KOLOYE V
12-13561
KOMAR A P
12-13441
KOMAROV V V
12-13537
KOMAROVSKII A N
12-13599
KOMOCHKOV M M
12-12948
KONDAKOVA E S
12-13635
KONDOH HISAMOTO
12-13224
KONDRASHOV A I
12-13163
KONDRATEV L N
12-13421
KONUMA MICHIJI
12-13347
KOPALEISHVILI T I
12-13576
KOPALEYSHVILI T I
12-13544
KOPPE H
12-13380
KORFF SERGE A
12-13339
KORNBICHLER HEINZ
12-13094 12-13506
KORNILOV I I
12-13155 12-13159
KOROBOCHKO YU S
12-13559
KOROLEV G A
12-13441
KOTANI TSUNEYUKI
12-13387
KOTENKO L P
12-13357
KRAFT O E
12-13432
KRAHE MATTHIAS
12-12931
KRASIN A K
12-13510
KRATSIK B
12-13420
KREKELER JEROME H
12-13045 12-13046
12-13047 12-13048
12-13049 12-13050
12-13051 12-13052
KRETZINGER NORBERT
12-13094
KRONIG R
12-13226
KRULFELD M
12-13115
KRUSKAL MARTIN
12-13629
KRUTOV V A
12-13427 12-13428
KUANG-CHAO CHOU
12-13413
KUHN A
12-12983
KUHN W
12-13007
KULAKOV M A
12-13118
KUNDU S K
12-13404
KUNKEL HANS-ADAM
12-12930 12-12931
KUTATELADZE S S
12-13095
KUTIKOV I YE
12-13417
KUZMIN I I
12-13538
KUZNETSOV E P
12-13357
KUZNETSOVA M YA
12-13545
KVASNIKOV I A
12-13609

L

LAPIDUS L I
12-13575
LAPOINTE JACQUES R
12-13512
LARSEN R C
12-13446
LARSON F R
12-13145
LATISHEVA V P
12-13148
LATTER ALBERT L
12-12947
LAUX PAUL G
12-12998
LAVRUKHINA A K
12-13638
LEBOEUF M B
12-13100
LEDDICOTTE G W
12-12996
LEEPER CHARLES K
12-13443
LEHFELDT D C
12-13080
LEMCOE M M
12-13082
LENGER V J
12-13021
LEONARD B R JR
12-13415
LEONARD W J
12-13177
LEPER D P
12-13625
LESNIK A G
12-13156
LESUEUR R
12-13265
LEVINE ARNOLD D
12-13353
LEWIS G C
12-13183
LEWIS LAWRENCE
12-13109
LEWIS W B
12-13467
LIBBY W F
12-13370
LICHTENBERG D B
12-13400
LIEBECQ C
12-12921
LIEBECQ-HUTTER SUZANNE
12-12921
LILIENTHAL JAMES R
12-13017
LILLI A B
12-13022
LINDBECK L
12-13017
LINGJAERDE ROLF O
12-13044
LINHART J G
12-13267
LIPINSKI W C
12-13450
LIPKIN H J
12-13612
LITTLE P F
12-13340
LITTLER D J
12-13448
LIVOVICH A F
12-13110
LOCHTE-HOLTGREVEN W
12-13269
LOEB L B
12-13270
LOEWENSTEIN P
12-13141
LOGAN M J
12-13187
LOWER P D
12-13271
LONDON H
12-13234
LONG P C
12-12995
LONG R S
12-13040
LOUNSBURY M
12-13535
LOVE B
12-13252
LOWERY AUSTIN
12-12913
LOWREY A R
12-13558
LUEBBEN T E
12-13018
LUNDY R A
12-13351
LUST R
12-13244 12-13261
LUTSIK V A
12-13571
LYSOV B A
12-13581
LYU KHAN-CHZHAO
12-13416
LYUBIMOV V A
12-13440 12-13595

M

MA S T
12-13611 12-13616
MAASS HEINRICH
12-12929 12-12992
12-12993

MACDONALD J E
12-13311
MADSEN P E
12-13633
MAECKER H
12-13272
MAISCH W G
12-13006
MAJEWSKA-NYRKOWA IVENA
12-12918
MAKINODAN T
12-12953
MAKSIMCHUK V P
12-13122
MALET L M
12-13369
MALKIN V I
12-13004
MALVICINI A
12-12950
MALVISINI A
12-12993
MAMASAKHLISOV V I
12-13544 12-13576
MANAKIN L A
12-13362
MANDELSTAM S
12-13273
MANDZHAVIDZE Z SH
12-13358
MANN WILFRID B
12-13587
MARKERT W JR
12-13112
MARLOW K W
12-13475
MARQUEZ L
12-13542
MARRIOTT R
12-13373
MARTIN B B
12-13062
MARTIN D F
12-13062
MARTIN J M
12-12945
MASE SHOICHI
12-13016
MASH D R
12-13454
MASLAN F
12-13456
MASON EDWARD A
12-13293 12-13295
MASON K F
12-13491
MASTEL B
12-13073
MASUDA YOSHIKA
12-13436
MATLI GIUSEPPE
12-12939
MATTHIAS B T
12-13597
MATVEEV A N
12-13557
MATVEYEV A N
12-13555
MAURER HANS-JOACHIM
12-12937
MAUTZ EARL W
12-13070
MCCARTY W K
12-13013
MCDANIEL B D
12-13352
MCGONNAGLE W J
12-13449
MCINDOE G R
12-13491
MCKAY H A C
12-13036
MEDIN A LOUIS
12-13514
MEDVECZKY L
12-13129 12-13327
MEIXNER BILLY D
12-13313
MEKHEDOV V N
12-12948 12-13545
MELNIKOV YU I
12-12980
MEMMERT GERHARD
12-13379
MESHCHERINOVA O N
12-13174
MEYER LEO M
12-12913
MICHALAK S
12-13328
MIKHEYEV M A
12-13098
MILES F T
12-13039
MILES M T
12-13262
MILLER D R
12-13017
MILLER J W
12-13457
MILLS T H
12-13018
MILNE K T W
12-13551
MILNER G W C
12-12994
MINEYEV V I
12-13553
MINKOV B YA
12-12987
MIRONOV S A
12-13601
MITCHELL D L
12-13134
MITIN N A
12-13356
MITTELMAN PHILLIP S
12-13598
MITUI TADAYASU
12-13167
MIURA IWAO
12-13586
MOISEIWITSCH B L
12-13568
MOJZIS J
12-12983
MOLYNEUX L
12-13392
MOMOTA TERUO
12-13540
MONK GEORGE S
12-13017
MONTANET L
12-13213
MOOS ANTHONY M
12-13190
MORALLI G J
12-13057
MORAVCSIK MICHAEL J
12-13345 12-13610
MORGAN C GREY
12-13259
MORGAN C S
12-12973
MORITA M
12-13620
MORITO NOZOMU
12-13305
MOROZ E M
12-13554
MORTIER P
12-13341
MOVCHAN B A
12-13161
MUKHTAROV A I
12-13569
MULLER HORST KARL-FRIEDRICH
12-13507
MURPHY GLENN
12-13084
MURRAY BRUCE B
12-12974
MURRAY E J
12-13184
MURRAY J H
12-13079
MURRAY P
12-13068 12-13072
MYULLER K
12-13428

N

NABARRO F R N
12-13636
NAGAMIYA TAKEO
12-13224
NAGAO SHIGEO
12-13275
NAISH S T
12-13106
NAKAGAWA KIMIKO
12-13347
NAKAZUMI YOSHIHIDE
12-13224
NATHANS R
12-13381
NATHER R E
12-13017
NEFF HAN
12-13227
NEILL F H
12-13460
NELLI JOSEPH R
12-13045 12-13046
12-13047 12-13048
12-13049 12-13050
12-13051 12-13052
NELSON R H
12-13309 12-13310
NELSON T C JR
12-13017
NEPORENT B S
12-13372
NEUMANN H
12-13559
NEUMANN P D
12-13113
NEUMANN WERNER
12-13596
NEWEY A B
12-13035
NEWTH J A
12-13213
NIESTERS H
12-13255
NIGHTINGALE R E
12-13010
NIKOLAEV K M
12-13303
NOTTINGHAM WAYNE B
12-13276
NOVIKOV A N
12-13171
NOVIKOV I I
12-13095
NOVOSCLTSEVA N D
12-13430
NOWSTRUP E I
12-13475

O

OAKES CARL L JR
12-13326
OBASHI MASAYOSHI
12-13225
OBUKHOVA M P
12-13130
ODAY MARCUS
12-13274
ODELL T T JR
12-12958
OESTMANN M J
12-13324
OGAWA IWAO
12-13539
OGAWA SHIZUKO
12-13437
OGDEN H R
12-13143
OHMURA HARUKO
12-13540
OKADA EIJI
12-13586
OKUN L B
12-13360 12-13361
OLSON R L
12-13483
OLT R G
12-13017
OMURA ITIRO
12-13305
OREHOSKI M A
12-13165
OREILLY B D
12-13498
ORR W L
12-13375
ORTNER GUSTAV
12-13501
OSBORNE M F
12-13008
OTT D G
12-12975
OTTENBERG A
12-13454
OWEN DONALD B
12-13316

P

PAINE K
12-13311
PAINE S HUGH JR
12-13017
PALMER J F
12-13466
PALMIERI GIAN GIUSEPPE
12-12955
PARCHWITZ HEINZ KARL
12-12935
PARKER FRANK L
12-13182
PARKER W E
12-13196
PARNELL JOHN
12-13543
PASQUILL F
12-12992
PAULSEN F R
12-13195
PAVLITSKAYA E D
12-13538
PAVLOTSKAYA F I
12-13638
PEARSON A DAVID
12-13005
PEASE L
12-13315
PECHEUX MICHEL
12-13394
PEKAR S I
12-13623
PEKER L K
12-13434 12-13435
PELEKIS L L
12-13606
PENNINGTON E M
12-13536
PEROVIC BRANA G
12-13206
PESCHANSKII V G
12-13172
PESTANER J F
12-13325
PETROV D A
12-13162
PETRUCCI G
12-13213
PHILBROOK W O
12-13166
PIERCY G R
12-13136
PIGFORD R L
12-13096
PIKAEVA V L
12-13027
PINNOCK D H
12-12995
PLAKSIN I N
12-13154
PLESCH R
12-13336
PLESSET MILTON S
12-12947
PLYSHCHEV V E
12-12990
POKIDYSHEV V V
12-13004
POLSTER A
12-13327
POLUKAROV YU M
12-13180
POMERANCHUK I YA
12-13360
POMERANTZ MARTIN A
12-13215
PONOMAREV J K
12-13601
POPOV B N
12-13102
POPOV YU S
12-13357
POPOVA A M
12-13537
PORTER BERNARD
12-12986
PORTER E S
12-13074
POSYSAYEVA L I
12-13174
POWELL W B
12-13011
POWERS H A
12-13511
POWLES J G
12-13602
PRADOS J W
12-13114
PREISER STANELY
12-13598
PREOBRAZHENSKII B K
12-13423 12-13424
12-13425 12-13432
PRESTON M A
12-13536
PRIKHODTSEVA V P
12-13429
PROSKURNIN M A
12-13025
PROTSENKO L N
12-13151
PROUT W E
12-13076
PROWSE W A
12-13277
PUGH S F
12-13132 12-13218
PULLMAN JRA
12-13473
PUTTER PAUL STEFAN
12-13230

Q

QUINLAN F B
12-13468

R

RAGENT BORIS
12-13092
RAIZER M D
12-13236
RAJARATNAM A
12-13256
RAJEWSKY BORIS
12-12938
RALL J EDWARD
12-12913
RANDALL I E
12-13099
RAPOPORT I D
12-13217
RAPP KENNETH I
12-13190
RASTRELLI L U
12-13082
RATHGEN GUNTHER HEIN
12-12933
RAU ERIC
12-13117 12-13491
RAY A E
12-13220
REAS W H
12-13470
REE FRANCIS H
12-13199
REE TAIKYUE
12-13199
REES D
12-13036
REID JAMES C
12-12923
REIFFERSCHEID H
12-13371
REMPES P E
12-13111
RESEGOTTI L
12-12924
REYNOLDS P
12-13241
REYNOLDS S A
12-12996
RHODIN T N
12-13147
RICHTER BURTON
12-13403
RIEDER W
12-13251
RIGBY M
12-13354
RINN FRIEDRICH H
12-13335
ROBBELEN GERHARD
12-12942
ROBERTS W H
12-13134
ROBSON J M
12-13381
RODIN S S
12-13065
ROGACHEV I M
12-13423
ROGERS B S
12-12975
ROINISHVILI N N
12-13358
ROKOTOVA N A
12-12920
ROLF ERICH
12-13520
ROMAN W G
12-13495
ROMANOV V A
12-13431
ROMANOVSKII E A
12-13442
ROSE BASIL
12-13233
ROSE D C
12-13211
ROSE D J
12-13278
ROSE M E
12-13592
ROSE R P
12-13495
ROSENFELD ARTHUR H
12-13391
ROSENFELD I L
12-13122
ROSINSKI JAN
12-12944
ROSSLE E
12-13209

ROUGERON CAMILLE
12-12905
ROWE JOHN P
12-13138
ROZENTAL T L
12-13409
RUETSCHI PAUL
12-13123
RUGGLES F H
12-13181
RULKER E
12-13299
RUNIANTSEV V V
12-13550
RUSSELL HELEN H
12-13058
RUTHER W E
12-13120
RYABUSHKO A P
12-13626
RYAZANOV M I
12-13627

S

SAITOV I S
12-13578
SALKOVITZ E I
12-13142
SALMERON R A
12-13213
SALMON
12-13296
SALSIG WILLIAM W
12-13548
SAMARIN A M
12-13157
SAMSONOV G V
12-13148
SAMUEL ARYEH H
12-13092
SANDERS C
12-12995
SANFORD E R
12-13582
SARAKHOV A I
12-13303
SAUER J A
12-13031
SAUTER FRITZ
12-13230
SAVAGE H C
12-13113
SAVITSKII E M
12-13160
SAWICKI JERZY
12-13533
SCHAEFFER RILEY
12-13043
SCHALL P JR
12-13324
SCHAMP HOMER W JR
12-13293
SCHEKMAN AL
12-12991
SCHERER EBERHARD
12-12925
SCHINDLER A I
12-13142
SCHINDLER K
12-13266
SCHLUTER A
12-13261 12-13279
SCHOFIELD R E
12-12997
SCHONHURER M J
12-13280
SCHOPPER E
12-13209
SCHOPPER H
12-13439
SCHOTTKY WALTER
12-12979
SCHUBERT GERHARD
12-12929
SCHULDINER S
12-12978
SCHULLER ALFRED
12-13508
SCHULZ A
12-13264
SCHULZ P
12-13281
SCHUMANN W O
12-13282
SCHWARTZ E G
12-13497
SCHWARTZ M A
12-13111
SCHWARTZBART HARRY
12-13139
SCHWEBER S S
12-13614
SCIAMA D W
12-13615
SCOTT J L
12-13114
SCOTT R C
12-13594
SEABORG G T
12-13306
SEEBOLD R E
12-13115
SEIDL RADKO
12-13395
SEILER G R
12-13035
SELIGER HOWARD H
12-13587
SEMENOVA A K
12-13127
SEN P
12-13399
SENS J C
12-13351
SEPPI E J
12-13415
SERAN P N
12-13491
SERGIENKO V A
12-13603
SESONSKE ALEXANDER
12-13099
SETENKO A G
12-13408
SETTER LLOYD R
12-12957 12-13058
SHAKHBEZYAN V A
12-13563
SHAKHNO I V
12-12990
SHAMMA MAURICE
12-13062
SHAPIRA RAYMOND
12-12949
SHEKARCHI I C
12-12953
SHEKHTER V M
12-13361
SHINOHARA KENICHI
12-13032
SHINOHARA UKICHI
12-13283
SHINYAEV A J
12-13153
SHIPP ROY L
12-13926
SHIROKOV M I
12-13413
SHMUILOVICH I KH
12-13118
SHMUSHKEVICH I M
12-13360
SHOCKEY E G
12-13490
SHORT B E
12-13460
SHPIGEL I S
12-13236
SHREDNIK V M
12-13060
SIDDIQ A K M
12-13419
SIDOROV V M
12-13382
SILBERBERG M
12-13524
SILIN V P
12-13173
SILVERMAN A
12-13352
SILVESTER A G
12-13017
SIMONOV YU N
12-13572
SIMONYI K
12-13284
SIMPSON E S
12-13181
SINCLAIR D A
12-13209
SINGER S F
12-13194 12-13214
SINITSYNA G S
12-13585
SITNIKOV K P
12-13410
SIX ERICH
12-12941
SMITH E E
12-12952
SMITH HAMPTON
12-13043
SMITH J F
12-13220
SMITH KENNETH
12-13374
SMITH L H
12-12958
SMITH T
12-13137
SMORODINSKII YA A
12-13580
SNOEBERGER D F
12-13017
SOKOLOV A A
12-13581
SOKURSKII IU N
12-13151
SOLDAN C H
12-13175
SOLN J
12-13349
SOLOVEV V G
12-13363
SOLOVEVA V I
12-13216
SOMMER ROBERT C
12-13190
SONNEN F K M
12-13226
SOPPET JEAN F
12-13109
SOROKER V
12-13103
SOYFER V N
12-13130
SPERA R J
12-13452
SPODE ERNST
12-12964
SPRINGER TASSO
12-13378
ST JOHN DANIEL S
12-13530
ST STENDER H
12-12943
STANG L G JR
12-13017
STARRATT F WESTON
12-13164
STEACIE E W R
12-13029
STENQUIST D R
12-13073
STEPANOV K N
12-13237
STERN SIDNEY
12-12991
STEVENS D J
12-12945
STEWART J C C
12-13448
STILWELL S N
12-13452
STRAUB CONRAD P
12-12957
STRAUCH D
12-12943
STRAUSS H J
12-13231
STRICKLAND GERALD
12-13017
STRINGHAM W S
12-13018
STROMINGER D
12-13306
STUART ROBLEY
12-12991
STURROCK P A
12-13291
SUHL H
12-13597
SUKHOV L V
12-13334
SUZUKI SHOJI
12-13539
SWANSON R A
12-13351
SWETNICK M J
12-13214
SWINBURN D
12-13000
SWOBODA T J
12-13064
SYKES J B
12-13025 12-13118
SYROVATSKY C J
12-13193
SZALAY A
12-13128 12-13129
SZEKELY ANGELIKA
12-13229
SZEPFALUSY P
12-13392

T

TARPEY T
12-13141
TASH J A
12-13513
TATARZYCKI E M
12-13488
TAVKHELIDZE A N
12-13562
TAYLER R J
12-13285
TAYLOR DENIS
12-13516
TAYLOR JOHN G
12-13345 12-13607
TELEGDI V L
12-13351
TEPE HANS-JOACHIM
12-13337
THACKRAY R W
12-13068
THEOBALD J KARL
12-13286
THOMAS D L
12-13312
THOMAS F D II
12-13062
THOMAS R B
12-13024
THOMPSON R C
12-12965
THOMPSON W B
12-13287
THURKAUF M
12-13007
THURSTON W R
12-13077
TIETZ T
12-13564
TIMUSHEV G F
12-13442
TIPTON CLYDE R JR
12-12972 12-13135
TISHKIN P A
12-13423
TITTERTON E W
12-12945
TOAL JANE NICOLET
12-12922 12-12923
TONKS LEWI
12-13017
TOOLE R C
12-13064
TOOPS EDWARD C
12-13530
TOPCHIEV A V
12-13026 12-13063
TOWNSEND J R
12-13010
TREACY P B
12-13418
TREIMAN S B
12-13383
TRILLING C A
12-13484
TRIVERO G
12-13589
TROSCHER HERBERT
12-13519
TROSSI L
12-13566
TRUBNIKOV B A
12-13238
TSARENKO N V
12-13097
TSUTSUMI KENJIRO
12-13225 12-13605
TURNBULL J
12-13332
TURNER FRANCES M
12-12961
TURNER L D
12-13017
TURRIN A
12-13552
TUTTLE L W
12-12915
TVERBERG J C
12-13468
TYREN HELGE
12-13590
TZOAR N
12-13348

U

UCHIDA ENJI
12-13224
ULRICH W C
12-13113
UMEZAWA HIROOMI
12-13347
UNTERMYER SAMUEL
12-13451
URETSKY JACK L
12-13345
URSO I S
12-12953
URSO PAUL
12-12949
USHA YE B
12-13302
UZSOKY M
12-13284

V

VAISMAN I A
12-13414
VALLE-RIESTRA J FRANK
12-13040
VAN CLEAVE C D
12-12967
VAN HOVE LEON
12-13567
VANDERSLICE JOSEPH T
12-13295
VARFOLOMEYEV A A
12-13333
VASENIN F I
12-12982
VASILIEV S S
12-13537
VAUGHAN J D
12-13064
VAYNSHTOK I
12-13103
VEDENKIN S G
12-13125
VENTERS LYDIA
12-13014 12-13148
12-13292
VERLET L
12-13401
VERWEIJ W
12-13288
VETROVA A V
12-12980
VICKERY R C
12-13604
VLASOV V S
12-13159
VOGELL WOLRAD
12-12925
VOGT R H
12-13475
VOLAROVICH M P
12-12987
VOLK E R
12-13459
VOLKOVA E A
12-13585
VON HOLLEN H
12-13457
VOSKRESENSKII A A
12-13015
VOSKRESENSKIY K D
12-13098

W

WACHSMANN F
12-12960
WADE WILLIAM R
12-13089
WAKATSUKI TETSUO
12-13586
WALDER D N
12-13332
WALDIE R D
12-12898
WALDRON M B
12-13132
WALKER C S
12-13461
WALKER R B
12-13090
WALLACE J J
12-13017
WANTER H P
12-13491
WARDLAW W
12-12985
WARE A A
12-13262
WATSON K M
12-13235
WATSON-MUNROE C M
12-13447
WEAVER H O
12-13491
WEBER B C
12-13111
WEESAKUL B
12-13543
WEILL J
12-13342

WEINBERG DANIEL I
12-13023
WEINREICH MARCEL I
12-12982 12-13093
12-13298 12-13299
12-13369
WEISNER E F
12-13486
WEISS J
12-13028
WENESER J
12-13591
WERDEN A C JR
12-13480
WESOLOWSKI J
12-13329
WEST HAROLD D
12-12966
WEST J M
12-13451
WETHERELL A M
12-13354
WHEELER C V
12-13457
WHIRL S F
12-13513
WHITAKER STEPHEN
12-13096
WHITE G K
12-13197
WHITE J L
12-13188
WHITE JULIUS
12-12922 12-12923
WHITMAN A
12-13074
WHITTUM H O JR
12-13376
WIGNER EUGENE P
12-13500
WILDERMUTH K
12-13398
WILLIAMS R BLAND JR
12-12922 12-12923
WILLIAMS RICHARD H
12-13301
WILLIAMS S L
12-13528
WILLIS N
12-13149
WILLMORE TRACY A
12-12971
WILSON E J
12-13377
WILSON R R
12-13352
WINTER H
12-12943
WINTERBERG F
12-13509
WINTON M L
12-13460
WIRTHS G
12-13071
WISE BYRON H
12-13009
WISWALL R H JR
12-13039
WITTEKINDT ELISABETH
12-12935
WOLTEN G M
12-13219
WOOD D E
12-12999
WOODRUFF TRUMAN O
12-13583
WOODS S B
12-13197
WORMALD J R
12-13354
WUTZ MAX
12-13556

Y

YABUMOTO TADARICHI
12-13200
YERKOVICH LUKE A
12-13144
YEROZOLIMSKIY B G
12-13417
YIGLANE KH
12-13364
YNTEMA L F
12-13140
YOVANOVITCH D D
12-13351
YUSHKEVICH G F
12-13432

Z

ZAEHRINGER ALFRED J
12-12988
ZAVARITSKII N V
12-13179 12-13203
ZAWADZKI A
12-13328
ZEITLENOK G A
12-13550
ZEVIN V YA
12-13228
ZHARKOV G F
12-13412
ZICHICHI A
12-13213
ZIV D M
12-13027 12-13585
ZOLOTAVIN A V
12-13420 12-13599

NUMERICAL INDEX OF REPORTS

This is a list of reports abstracted in this issue of *Nuclear Science Abstracts*, with the corresponding abstract number reference.

The report number codes listed below apply to AEC reports unless otherwise designated. Other codes are listed as British, Canadian, or Non-AEC. Those codes marked Misc. are used for both AEC and non-AEC reports. For a complete description of all report number codes used by the AEC, see TID-85, *Report Number Series Used by the Technical Information Service in Cataloging Reports*. September 1957. 112p. $3.00 (OTS). Some reports appear under more than one code designation and wherever practical all report numbers are listed in this index.

Report No.	Abstract No.
AD (Misc.)	
135086	12-13078
137101	12-12968
142016	12-13190
148146	12-13133
150658	12-12947
155525	12-13062
155570	12-13144
157172	12-13324
158241	12-13558
158309	12-13383
158326	12-12971
162160	12-13607
AEC-tr	
2518	12-12979
3255	12-12980
3287	12-13147
3288	12-13191
3303	12-13292
3310	12-13192
3312	12-13057
3320	12-13014
3321	12-13148
3323	12-12981
AECL (Canadian)	
317	12-13315
641	12-13535
646	12-13107
648	12-13136
650	12-13466
651	12-13467
AECU	
3599	12-13066
3666	12-12944
3777	12-13443
3779	12-13444
3780	12-13035
3781	12-12991
3783	12-13445
3790	12-13446
AERE-C (British)	
M-229	12-13067
M-342	12-12969
R-1199	12-13036
R-2502	12-13024
R-2527	12-12994
AERE-GP (British)	
R-2058(Pt. 2)	12-12970
AERE-I (British)	
R-759	12-13631
AERE-M (British)	
M-193	12-13131
M-194	12-13037
R-632	12-13068
R-741	12-13633
R-873	12-13218
R-1049	12-13069
R-2554	12-13132
AERE-Med (British)	
M-24	12-12961
R-2586	12-12995
R-2587	12-13323
AERE-N (British)	
R-121	12-13447
R-131	12-13448
AERE-R (British)	
R-2525	12-13106
AFOSR-TN (Non-AEC)	
58-97	12-13133
58-499	12-13383
58-515	12-12971
58-630	12-13607
AFOSR-TR (Non-AEC)	
58-63	12-13558
AFSWP (Non-AEC)	
939(Pt. 2)	12-13184
ANL	
4670(Del.)	12-13017
5261	12-13451
5654	12-13449
ANL	
5850	12-13450
5860(Pts. 1 and 2)	12-13374
5874	12-13038
ANU/P (Non-AEC)	
189	12-12945
APEX (Misc.)	
358	12-13452
372	12-13318
376	12-13309
384	12-13134
392	12-13310
394	12-13453
395	12-13375
396	12-13311
ASAE-S	
4	12-13454
AWRE-Trans (British)	
9	12-13193
BAW	
74	12-13455
74-1	12-13455
BMI (Misc.)	
1062(Del.)	12-12972
1247	12-13135
BNL	
482	12-13039
491	12-13456
497	12-12946
501	12-12913
502	12-13384
BRD	
57-2C1	12-13092
BW (Misc.)	
3794	12-13112
CF (Oak Ridge National Lab.)	
56-7-106(4th Issue)	12-12996
57-8-6	12-13457
CF (Oak Ridge National Lab.)	
58-4-7	12-13458
58-4-131	12-13113
58-6-86	12-13008
58-7-43	12-13459
58-7-48	12-13460
58-7-56	12-12973
58-7-64	12-13461
58-7-85	12-13462
58-7-86	12-13463
58-7-104	12-13114
58-7-122	12-13529
58-8-2	12-13464
58-8-4	12-13465
CRMet (Canadian)	
763	12-13107
782	12-13136
CRR (Canadian)	
749	12-13466
CU (Misc.)	
171	12-13385
D (Misc.)	
143-941-035	12-13081
DF (Misc.)	
56-AD-30	12-13446
DM (Canadian)	
52	12-13467
DOW	
98	12-13040
DP	
279	12-13530
293	12-13041
297	12-12974
GAT	
236	12-13087
GAT-DM	
695	12-13312
GAT-T	
518	12-13018

NUMERICAL INDEX OF REPORTS

Report No.	Abstract No.
HW	
23141	12-13042
30128	12-13415
46701(Del.)	12-13079
48460(Del.)	12-13088
48814	12-13559
49423	12-13468
50580	12-13080
51712	12-13073
55173	12-13469
55211-RD(Del.)	12-13010
56040	12-12965
56640-A2	12-13470
IDO	
12003	12-13368
IGO-AM (British)	
W-69	12-12910
ISC	
867	12-13043
951	12-13220
1030	12-13185
JENER (Non-AEC)	
55	12-13044
56	12-13471
JPL-Pub. (Misc.)	
122	12-13011
KAPL	
1925	12-13100
KAPL-M	
RES-2	12-12997
KS	
336	12-13634
KT	
335	12-13035
LA	
2176	12-12975
2198	12-13313
MAB (Non-AEC)	
135-M	12-12962
MSAR-TR (Non-AEC)	
321-12	12-13081
NAA-SR	
2380	12-13376
2457	12-13012
2538	12-13219
2600	12-13478
2628	12-13137
2687	12-13019
2693	12-13002
NAA-SR-Memo	
1903	12-13013
2127	12-13472
NACA-TN (Non-AEC)	
4206	12-13089
4329	12-13138
NAVSHIPS	
250-346	12-12976
NDA (Misc.)	
014-167	12-13474
14-26	12-13473
10-144	12-13598
NGTER (British)	
143	12-13090
NLCO	
719	12-13045
732	12-13046
734	12-13047
735	12-13048
736	12-13049
738	12-13050
739	12-13051
740	12-13052
742	12-12998
743	12-13070
744	12-13053
NMI	
1203	12-13141
NP (AEC File No. for Non-AEC Reports)	
6812	12-12898
6830	12-13139
6835	12-13186
6838	12-12977
6839	12-12908
6843	12-13140
6848	12-12909
6849	12-13187
NP-tr (AEC File No. for Non-AEC Translations)	
110	12-13149
119	12-13025
120	12-13118
NRC (Canadian)	
4776	12-13210
4786	12-13197
4789	12-13211
NRL (Non-AEC)	
5091	12-12978
5142	12-13475
5152	12-13115
5159	12-13188
5161	12-13142
NYO	
208(Suppl.)	12-13054
210	12-13055
2322	12-13082
7499	12-13031
8579	12-13406
8601	12-12963
ORNL	
2480	12-13297
2534	12-13314
2545	12-13476
2549	12-12911
2556	12-13386
PTP (British)	
561	12-12992
RCTC (British)	
38	12-13067
RCTC/P (British)	
118	12-13024
REIC (Non-AEC)	
6	12-13324
RM (Misc.)	
1956(RAND)	12-12947
RPI (Canadian)	
9(AECL)	12-13315
SC (Misc.)	
4122	12-13108
SCL-T	
9	12-13093
170	12-13298
171	12-12982
184	12-13369
186	12-13299
SCR	
20	12-13316
SCTM	
177-58(15)	12-13317
237-58(51)	12-13189
SDR	
645	12-13443
SPM (Non-AEC)	
305	12-13477
TID	
5345	12-13634
4100(1st Rev. and Suppl. 1)	12-13083
7553	12-13478
7553(p.17-34)	12-13479
7553(p.35-56)	12-13480
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7553(p.113-50)	12-13484
7553(p.151-95)	12-13485
7553(p.197-209)	12-13486
10087	12-13091
TML (Non-AEC)	
103	12-13143
TT (Canadian)	
745	12-13209
UCLA	
429	12-12914
UCRL	
3798	12-13387
3944	12-13547
4518	12-13388
4807	12-13208
5094	12-13439
5208	12-13531
5209	12-13389
5269-T	12-13390
UCRL	
5305	12-13092
8030	12-13391
8215	12-13532
8261	12-13548
8302	12-13344
8317	12-13345
UR	
511	12-12915
523	12-12916
USAFIT-TR (Non-AEC)	
58-12	12-13487
USNRDL-TR (Non-AEC)	
244	12-13325
WADC-TN (Non-AEC)	
56-190	12-13326
WADC-TR (Non-AEC)	
54-270(Pt. 4)	12-13144
55-220(Pt. 4)	12-13009
56-203(Pt. 3)	12-13062
57-605	12-13190
WAL-TR (Non-AEC)	
401/300	12-13145
WAPD-CTA	
(EDX)-265	12-13488
(EML)-426	12-13490
(EMD)-395	12-13489
(ME)-223	12-13491
(ME)-250	12-13116
(MEE)-463	12-13117
(MEE)-492 and Add.	12-13492
(MEE)-510	12-13117
(MEE)-512	12-13493
WAPD-P	
656	12-13582
WAPD-RM	
182(Del.)	12-13494
WAPD-T	
351	12-13495
445	12-13496
484	12-13497
WAPD-TM (Misc.)	
136	12-13498
WAPD-ZH	
9	12-13146
WIN	
99	12-13074
104	12-13056
XDC	
57-11-91	12-13309
58-3-169	12-13318
58-5-167	12-13453
58-7-18	12-13375
58-7-19	12-13310
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YAEC	
58	12-13109
89	12-13499

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